

## **SECTION 8.0 – DREDGING MANAGEMENT PLAN**

## **8.0 DREDGING MANAGEMENT PLAN**

This FEIR identifies the Pope’s Island North site as the preferred alternative, and recommends that the PIN area be designated by the Secretary of EOEa as an approved location for the construction of CAD cells. This section describes and provides the framework for the management tools that must be developed to support use of the designated CAD area by individual projects.

As is discussed above, this FEIR distributes capacity, based on the geotechnical characteristics of the PIN area, in a conceptual scheme that serves as the basis for long-term use of the CADs. The specific size and location of individual CADs located within the PIN area will be determined by the specific dredging program developed by New Bedford and Fairhaven. Local, state, and federal permitting requirements (or equivalent authorizations – see below) require detailed and site specific information regarding site engineering, chemistry, mitigation, and operations that will be developed by future project proponents. This section provides the framework for the following elements of the dredging management plan:

- Project management (design, permitting, operations, monitoring)
- Draft 401 Water Quality Certification Regulations (314 CMR 9.00)
- Approved sediment sampling and testing plan
- Project management plan (operations plan)
- Best management practices for CAD (planning, design, construction, disposal, capping, monitoring)
- Model Water Quality Certificate
- Independent Third Party Inspection

### **8.1 Project Management**

The FEIR recommends a management structure under which New Bedford and Fairhaven manage CAD use under the terms of a Water Quality Certificate and Chapter 91 Waterways license of permit, or equivalent authorizations. (Under the terms of the Record of Decision for the New Bedford/Fairhaven Harbor PCB Superfund project, navigation dredging may be undertaken under the auspices of the state enhanced remedy. If so, the substantive requirements of the state regulatory programs must be met, but the certificate, license or permits themselves would not be issued.) The town and city will need to demonstrate that they and/or their consultant(s) have the professional capacity and experience to actively manage the dredging contractor. Local management will be augmented by the services of a Third Party Inspector, who will observe field operations in the context of project authorizations and report directly to the Department of Environmental Protection (DEP). As recommended by the DEIR, the FEIR recommends that a Technical Advisory Committee (TAC) be established to assist DEP. The TAC can be an ad hoc group of local, state and federal agency staff available to respond to questions, to review ongoing project monitoring information, and/or make recommendations to DEP as requested.

It is important to emphasize that CAD operations are not a routine marine construction process. State and federal agencies’ experience with the Boston Harbor CADs amply demonstrated that

field operations do not always conform to expected conditions, and that there must be an established feed-back loop between the contractor, the manager, and regulators. In some instances it may be the Third Party Inspector who provides that function, but in other situations the perspective of the TAC members can be invaluable in providing DEP and/or the contractor with the guidance needed to make decisions regarding the interpretation of permit conditions. In addition, the presence of a TAC allows the Water Quality Certificate (or equivalent) to be written to give the contractor greater flexibility in operations, as opposed to being a restrictive permit that requires continual and time-consuming formal amendment as unexpected conditions are encountered in the field.

In summary, under this approach the city and town would manage the CADs subject to applicable local, state and federal authorizations; a Third Party Inspector will provide field oversight for DEP; and a Technical Advisory Committee to be determined will assist DEP in monitoring CAD operations. The FEIR anticipates that the management structure for use of the PIN CADs will be formally defined in the development of the Water Quality Certificate or Chapter 91 Waterways license or permit, or equivalent.

## **8.2 Draft 401 Water Quality Certification Regulations (314 CMR 9.00)**

The DEP is currently finalizing revised regulations to govern state 401 Water Quality Certifications (314 CMR 9.00). The regulations, currently in draft, address dredging and aquatic and upland disposal and reuse through an integrated regulatory framework. The draft regulations also draw on DEP's experience with the Boston Harbor Navigation Improvement Project and include provisions that specifically address CAD disposal. The provisions of the draft regulations specific to CADs are summarized below.

### **General**

- Confined aquatic disposal of material unsuitable for open ocean disposal shall include management techniques to isolate the material from the surrounding environment.
- Factors governing the evaluation of a site's suitability for confined disposal include fisheries, shellfish, wetland resources, fisheries habitat, recreational activities, hydrodynamic characteristics, geotechnical characteristics and unique site factors and conditions.

### **Placement**

- Dredged material placement shall be designed to minimize release of sediment to the environment
- placement shall occur during specific periods of time to minimize dispersion and transport and maximize dilution
- Adequate consolidation time shall be provided prior to cap placement

### **Design standards**

- Vessel traffic impacts to operational CADs shall be minimized
- A water quality model shall be employed to assess compliance with water quality standards and to determine if disposal management restrictions are necessary

- If possible, more contaminated material shall be placed in CADs first, to provide additional environmental protection
- CAD cell caps shall be placed to minimize the disturbance of material in the cell
- For cap placement, the amount, location, and track of the disposal vehicle over the cell shall be documented; surveys shall verify that required cap areal and vertical coverage is achieved; cap material shall be placed wet; tugs shall be used to propel deep draft placement vessels to minimize prop wash; the cap shall cover a minimum of 90% of the surface area of the cell; and the required thickness of the cap shall be comprised of at least 70% sand or other approved material.

Monitoring (in addition to chemical and physical monitoring of on-going project operations – see DEIR section 9.0)

- A disposal management plan shall be developed
- Bathymetric surveys shall be conducted prior to cell excavation, after cell is excavated, after the disposal of dredged material, and after the cap is placed
- Baseline water quality chemistry shall be established prior to any dredging or disposal
- Each disposal event shall document operation, navigation, and meteorological conditions
- CAD cell caps shall be monitored at one and five year intervals post closure to evaluate cap thickness and long-term cap integrity; benthic recolonization shall be monitored at one year post closure

### **8.3 Sediment Sampling and Testing Plan**

Project-specific sediment testing of the surficial CAD sediments will be necessary to characterize the material for disposal or reuse alternatives. The extent and frequency of samples will be determined by the proposed disposal/reuse option. It is not possible to provide a formal and approved sampling plan until the volume to be dredged and the selected location of the CAD and its underlying geophysical characteristics have been determined, because the surficial footprint of the CAD will be determined by those factors. Alternatively, the entire PIN area could have been sampled and tested, but that would not have been cost effective, given the proposed sequential use of the area, and because sediment data and suitability determinations derived from there have a five-year shelf life.

To provide most of the necessary information, and allow project-specific sampling and testing to proceed expeditiously, this FIER has developed a formal sampling and testing plan for the entire PIN CAD area, submitted the plan for review by the Corps of Engineers and its sister federal agencies, and received formal plan approval. Thus, once specific projects are defined, the appropriate aspects of the approved sampling and testing plan can be identified and coordinated with DEP and the Corps in the context of the disposal/reuse options being considered. In addition to providing accurate cost figures for project planning, this should significantly expedite the sampling and testing schedule. The approved plan is presented in Appendix A of this Section.

#### **8.4 Dredging Management Plan**

This FIER provides the outline of a Dredging Management Plan (DMP) for CAD operations. The DMP outline was developed by the Corps of Engineers Project Manager for the Boston Harbor CAD project in association with the Independent Observer for the same project, and is based on their mutual, extensive experience with the design, permitting, and operations of the Boston project (ENSR, 2001). That experience is documented in *Summary Report of Independent Observations Phase 1 - Boston Harbor Navigation Improvement Project*, ENSR, October 1997; and *Boston Harbor Navigation Improvement Project Phase 2 Summary Report*, U.S. Army Corps of Engineers, New England District and Massachusetts Port Authority Maritime Department, May, 2002. A DMP will be a required element of the Water Quality Certificate or Chapter 91 Waterways license or permit, or equivalent authorization, in conjunction with all applicable information required pursuant to the draft regulations at 314 CMR 9.00.

The Model DMP presented below is based on the Boston Harbor CAD project (ENSR, 2001) and was developed for a fictitious harbor. The intent of the model is NOT to provide a template for a similar authorization for New Bedford/Fairhaven, but to provide an example of the kinds of information that should be incorporated in a formal DMP. The model DMP is presented in Appendix B of this Section.

#### **8.5 Best Management Practices for CAD Operations**

This FEIR provides Best Management Practices (BMPs) for CAD operations that should be considered in conjunction with the DEP draft regulations at 314 CMR 9.00 in the development of project-specific plans. The BMPs were developed by the authors described above (ENSR, 2001) based on their experience with the Boston Harbor CAD project. Not all aspects of the BMPs will be applicable, and, where they may conflict with the DEP regulations at 314 CMR 9.00, the DEP regulations control. The BMPs are provided as guidance only. The model BMPs document is presented in Appendix C of this Section.

#### **8.6 Model Water Quality Certificate**

The DEIR describes a tiered approach to water quality monitoring, based on experience with the Boston Harbor CAD project and other major projects. The specific elements of the Water Quality Certificate, or equivalent authorization, will be developed by DEP and based on the draft regulations at 314 CMR 9.00. The Model Water Quality Certificate presented below is based on the Boston Harbor CAD project (ENSR, 2001) and was developed for a fictitious harbor. The intent of the model is NOT to provide a template for a similar authorization for New Bedford/Fairhaven, but to provide an example of the kinds of monitoring in Boston Harbor that proved to be successful (i.e., provided meaningful data that could be used to make informed and timely decisions about project operations, potential impacts, and regulatory conditions imposed on the project) and, sometimes, not as successful. The model Water Quality Certificate is presented as Appendix D of this Section.

## **8.7 Third Party Inspector**

The following is a description of the Third Party Inspection Program provided by DEP.

### ***8.7.1 Introduction and Purpose***

The Massachusetts Department of Environmental Protection (“DEP”) requires that the permittee retain the services of an independent third-party inspector to participate in field decisions and to monitor compliance with the 401 Water Quality Certificate (“401 WQC”) during dredging and related activities.

The objectives of the third party inspection program are:

1. to monitor all dredging and related activities to assure compliance with the 401 WQC; and
2. to provide interpretation of 401 WQC conditions and standards at the request of the permittee.

This document establishes the Independent Third Party Inspection Program (“3PIP”) and outlines the responsibilities of permittee, DEP, and the Third Party Inspector (“3PI”) under the 3PIP. Notwithstanding the duties of the 3PI stated herein, DEP reserves the right to inspect the Project at any time.

### ***8.7.2 Selection of Independent Third-Party Inspector***

#### **8.7.2.1 Process**

The selection of the 3PI shall be a collaborative effort of permittee and DEP. The permittee shall present the names of a qualified 3PI to DEP no later than 20 days prior to commencement of construction. If DEP does not make a selection within 10 days of receipt of the names, the permittee may invoke the dispute resolution mechanism set out in Section 7 below. In the event DEP rejects all candidates identified by the permittee, DEP shall state the reasons for such denial with particularity. The permittee may then either provide additional candidates or invoke the dispute resolution mechanism set out in Section 7 below.

#### **8.7.2.2 Qualifications**

The 3PI shall have the following minimum qualifications:

1. a degree in an environmental science or environmental engineering (or equivalent working experience) and a working knowledge of marine ecosystems;
2. the 3PI shall have dredging inspection experience;
3. the ability to clearly understand and articulate state and federal permits and conditions and effectively communicate with appropriate contractor and agency personnel;
4. the ability to clearly document activities being inspected;

5. qualified support staff with appropriate facilities to carry out the Duties and Responsibilities set forth in Section 3.0 of this document in a timely manner.

#### 8.7.2.3 Approval

No 3PI shall be formally and finally engaged for service on the Project prior to DEP selection as referenced above.

#### 8.7.2.4 Duties and Responsibilities

There shall be at least one 3PI per construction spread, whose duties shall consist of the following:

1. Prior to construction, become thoroughly familiar with pertinent Project documents, and relevant plans, etc.
2. Prior to construction, become thoroughly familiar with the terms and conditions of the Army Corps of Engineers permit, the 401 WQC, and the local Wetlands Protection Act (“WPA”) Orders of Conditions for the Project.
3. Monitor dredging and related activities of the Project for compliance with the 401 WQC.
4. Maintain whatever records and photographs are necessary for the recording of observations, events, and possible non-compliance with 401 WQC conditions. Submit written reports to the DEP Project Manager, as required in Section 4.0 below.

It is expected that the 3PI will work with the permittee to identify and avoid permit compliance problems. If the 3PI observes a 401 WQC violation that poses an immediate threat to a protected resource, s/he may direct the contractor to cease the activity and/or take immediate corrective action. The 3PI may make informal recommendations to permittee as appropriate to ensure permit compliance. The 3PI shall have authority to submit compliance issue reports to DEP as set forth in Section 4.0 and may contact DEP at any time to communicate a violation. If the 3PI orally reports a violation to DEP, the 3PI shall provide immediate notice to the permittee and document the violation in writing.

### ***8.7.3 Activity Documentation and Communication***

#### 8.7.3.1 Routine Reporting

The 3PIs will submit weekly written reports of their activities to designated contact(s) within DEP, with copies to the permittee. These reports shall include a summary of daily activities as they relate to permit conditions or permit condition interpretations and other notable or significant activities.

#### 8.7.3.2 Required Action Report (“RAR”)

RARs will be completed by the 3PI to record a matter requiring corrective action, including potential violation of the 401 WQC, and generally will follow failure to address problems identified.

An RAR will be completed only when the permittee has failed to take corrective action after having been notified of a problem. Before submitting an RAR, the 3PI will consult with the permittee concerning the circumstance potentially requiring the issuance of the report and provide an opportunity for the permittee to take corrective measures. If corrective action is not taken, the 3PI shall consult with the DEP, and if appropriate, complete the RAR and issue copies to the permittee and DEP. Final resolution of the RAR will be recorded by the 3PI and documented to DEP when the situation has been corrected.

#### ***8.7.4 Communication and Coordination***

##### 8.7.4.1 Communication with DEP

The 3PI shall report directly to DEP. The 3PI shall contact DEP staff to obtain clarifications, intent and interpretation of conditions, and to discuss issues of compliance. DEP’s determination as to interpretations of the 401 WQC and conditions shall be binding on the 3PI. If a potential noncompliance issue is identified which requires some interpretation of the 401 WQC and conditions, the 3PI shall consult with DEP staff and determine whether, in fact, a non-compliance issue or permit violation is present. In turn, DEP staff will contact the 3PIs to solicit comments and input for site-specific issues, permit modifications, and other relevant permitting approvals. DEP will coordinate field inspections with the 3PI.

##### 8.7.4.2 Coordination with Project Staff

*Environmental Inspectors.* Notwithstanding the 3PI’s direct reporting obligation to DEP, it is expected that the 3PI will maximize communication and coordination with permittee as a means of avoiding permit compliance problems.

*Contractor Personnel.* In order to maintain the proper chain of command for information dispersal, the 3PIs shall not interact directly with contractor personnel unless they see a potential violation of the 401 WQC and conditions that poses an immediate threat to a protected resource. The 3PIs shall immediately notify the permittee’s designee of any violations of the 401 WQC and conditions. The 3PIs shall not direct the activities of contractor personnel except when he observes a 401 WQC violation that poses an immediate threat to a protected resource, in which case he may direct the contractor to cease the activity and/or take immediate corrective action.

#### ***8.7.5 Program Implementation***

This section provides a discussion of the specific activities undertaken by the 3PI in implementing the 3PIP.



#### 8.7.5.1 Construction Activities

The 3PI shall review and become familiar with the project. An overview of the Project will be provided to the various agency, inspection, and contractor personnel and set the ground rules for the Project with regard to construction, safety, and environmental compliance.

The 3PI shall retain all log books, data forms, photos and other records in connection with the Project and shall make such records reasonably available for inspection by DEP and the permittee. It is expected that the 3PI will maintain detailed records such that a full post-dredging report can be generated, if requested.

#### ***8.7.6 Dispute Resolution***

This section details how disputes in the selection of the 3PI or in the field shall be resolved.

Any dispute over the selection of the 3PI shall be decided by the Director of DEP's Wetlands and Waterway Program in Boston after an opportunity by both staff and the permittee to be heard. The Director's decision shall be final.

Disputes in the field over the 401 WQC and conditions shall be resolved as follows:

1. In the first instance, the parties (the 3PI, the permittee, and DEP Project Manager) shall engage in informal discussions within a period of 12 hours.
2. If the dispute persists, any party may appeal to the Director.

Disputes in the field over conflicts between the 401 WQC and conditions shall be resolved as in 7.2. However, any appeal by the parties must be made the Director or his/her designee.

#### ***8.7.7 Evidentiary Privilege***

Neither the 3PI nor the permittee may claim any evidentiary privilege to prevent disclosure of communications, written or oral, between the 3PI and the permittee or the permittee's agents.

**APPENDIX A**

**The Approved Sampling Plan**

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RECEIVED  
SEPT 15  
2003

CENAE-R-PT (1145-2-303B)

9 September 2003

**MEMORANDUM FOR:** Brian Valiton, Project Manager, CENAE-R-PEA

**SUBJECT:** Sampling Plan for New Bedford Harbor CAD Site, New Bedford Harbor, New Bedford and Fairhaven, MA. Application Number 2003-01360.

1. In response to your request of 26 June 2003, I have developed a sampling plan for the above project. The applicant is proposing to mechanically dredge approximately 2,677,025 cu. yds. of material from an area of approximately 90 acres in New Bedford, MA and dispose of it at the Buzzards Bay Disposal Site (BBDS). This dredging project is composed of two sections. The first is the top four feet of the sediments which have been designated as sediments contaminated enough to require managed disposal. The upper layer of significant contamination has been identified by following metal contaminant profiles to a minimal concentration horizon, (Memorandum of 19 June 2003, to ACOE from Maguire Group, Inc, Henry Merrill, Senior Environmental Planner).

[Editor's note: The suitability determination process is designed to determine whether dredged material contains levels of contaminants that would render it unsafe for unconfined open-water disposal. The closest such site to New Bedford is the Buzzards Bay Disposal Site (BBDS).

This suitability determination is not an application to the Corps for the use of the BBDS, but an application for the issuance of a sampling plan that may be used by private, municipal and/or federal dredging projects in the future.]

Below this layer of approximately 580,000 cu. yds. lies material that has the potential to be suitable for open water disposal. This is because the depth of this layer (-4' MLW to -14 MLW) places it below the horizon above which sedimentation rates over the last 150 years would have exposed it to contamination from historical anthropological inputs to the harbor. This layer (with an approximate volume of 2,677,025 cu. yds.) is the material the applicant is proposing to dredge and dispose of at the Buzzards Bay Disposal Site (BBDS).

2. **SPILLS & OUTFALLS:** New Bedford Harbor has a 150-year history of heavy industrial use. This history results in numerous spills and inputs of contaminants of concern. The most significant contaminant of concern in the Harbor are the polychlorinated biphenyls (PCB) which were deposited in the 1930's, 1940's and 1950's during the heyday of a local electrical transformer industry. These resulted in PCB concentrations of 5-50 ppm in the immediate vicinity of the Project location (see Figure 1).

3. Six cores (NB-1 through NB-6) should be taken from the area to be dredged according to the attached plan (see Figures 2 and 3). Core samples should be taken to the proposed dredge depth. All sediments being held for testing should be stored in accordance with the requirements of Table 8-2 in Evaluation of Dredged Material Proposed for Ocean Disposal, Testing Manual, 1991.

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SUBJECT: Draft Sampling Plan for New Bedford Harbor CAD Site, New Bedford Harbor, New Bedford and Fairhaven, MA. Application Number 2003-01360.

4. Cores should be subsampled and analyzed for grain size, PCBs and metals at two-foot intervals and the results from these analyses reported to me before any compositing is performed. I will review the data and determine if compositing is appropriate.
5. Bulk sediment chemistry analyses should be done on each composite sample according to the Guidance for Performing Tests on Dredged Material to be Disposed of in Open Waters, (draft, May 15, 1989). The test parameters should include all of the items on the attached sheet except for the metals and PCBs that were tested previously. These parameters are extracted from Table 1A and Table 1B of the Guidance for Performing Tests on Dredged Material to be Disposed of in Open Waters. The detection limits should be those indicated on the attached sheet. The listed analytical methods are recommended but can be replaced by other methods that will give the required detection limits. The Total Organic Carbon analysis (TOC) should be done in duplicate on each composited sample and a TOC Standard Reference Material (SRM) should be run with the sample batch.
5. Copies of this draft sampling plan were sent to the State DEP, US EPA and US NMFS. The EPA concurred with the sampling plan. The other agencies did not respond and their *concurrence* is assumed.
6. If you, the applicant or the testing laboratory have any questions, feel free to call me at (978) 318-8336.

CHARLES N. FARRIS  
Project Manager  
Marine Analysis Section

CENAE-R-PT

SUBJECT: Draft Sampling Plan for New Bedford Harbor CAD Site, New Bedford Harbor, New Bedford and Fairhaven, MA. Application Number 2003-01360.

BULK SEDIMENT *TESTING* PARAMETERS

Parameter	Analytical Method	Detection Limit (ppm)
Metals		
Arsenic	7060, 7061	0.5
Cadmium	7130, 7131	0.1
Chromium	7190, 7191	1.0
Copper	7210	1.0
Lead	7420, 7421	1.0
Mercury	7471	0.02
Nickel	7520	1.0
Zinc	7950	1.0
PCBs (total by NOAA summation of congeners)	8082	0.001
Pesticides	8081A	0.02
Aldrin	Endrin	
Chlordane	Hexachlorobenzene	
DDT	gamma <i>Hexachlorocyclohexane</i> (Lindane)	
DDE	Heptachlor	
DDD	Heptachlor Epoxide	
Dieldrin	Methoxychlor	
Endosulfan I	Toxaphene	
Endosulfan II	Trans-nonachlor	
Endosulfan Sulfate		
Polyaromatic Hydrocarbons (PAH's)	8270	0.02
Acenaphthene	Chrysene	
Acenaphthylene	Dibenzo(a,h)anthracene	
Anthracene	Fluoranthene	
Benzo(a)anthracene	Fluorene	
Benzo(a)pyrene	Indeno(1, 2, 3-cd)pyrene	
Benzo(b)fluoranthene	Naphthalene	
Benzo(k)fluoranthene	Phenanthrene	
Benzo(g, h, i)perylene	Pyrene	
Dioxins/furans	8290	5 parts per trillion
Total Organic Carbon	9060	0.1%
Percent Water		1.0%
Grain Size	Wet Sieve (#4, 10, 40,200)	

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SUBJECT: Draft Sampling Plan for New Bedford Harbor CAD Site, New Bedford Harbor, New Bedford and Fairhaven, MA. Application Number 2003-01360.

### PCB CONGENERS

Analytical Method: EPA Method 8082 Target Detection Limit: 1 ppb Congeners

8*	2,4' diCB
18*	2,2',5 triCB
28*	2,4,4' triCB
44*	2,2',3,5' tetraCB
49	2,2',4',5 tetraCB
52*	2,2',5,5' tetraCB
66*	2,3',4,4' tetraCB
87	2,2',3,4,5' pentaCB
101 *	2,2',4,5,5' pentaCB
105"	2,3,3 ',4,4' pentaCB
118*	2,3 ',4,4',5 pentaCB
128"	2,3,3',4,4' hexaCB
138*	2,2',3,4,4',5' hexaCB
153"	2,2',4,4',5,5' hexaCB
170*	2,2',3,3 ',4,4',5 heptaCB
180*	2,2',3,4,4',5,5' heptaCB
183	2,2',3,4,4',5',6 heptaCB
184	2,2',3,4,4',6,6' heptaCB
187*	2,2',3,4',5,5',6 heptaCB
195*	2,2',3,3',4,4',5,6 octaCB
206*	2,2',3,3',4,4',5,5',6 nonaCB
209*	2,2',3,3',4,4',5,5',6,6' decaCB

The specified method is a recommendation only. Other acceptable methodologies capable of meeting the Target Detection Limits can be used. Sample preparation methodologies (e.g. extraction and cleanup) and sample size may need to be modified to achieve the required target detection limits.

• denotes a congener to be used in estimating Total PCB. To calculate Total PCB, sum the concentrations of all eighteen congeners marked with a "\*" and multiply by 2.

Figure 1

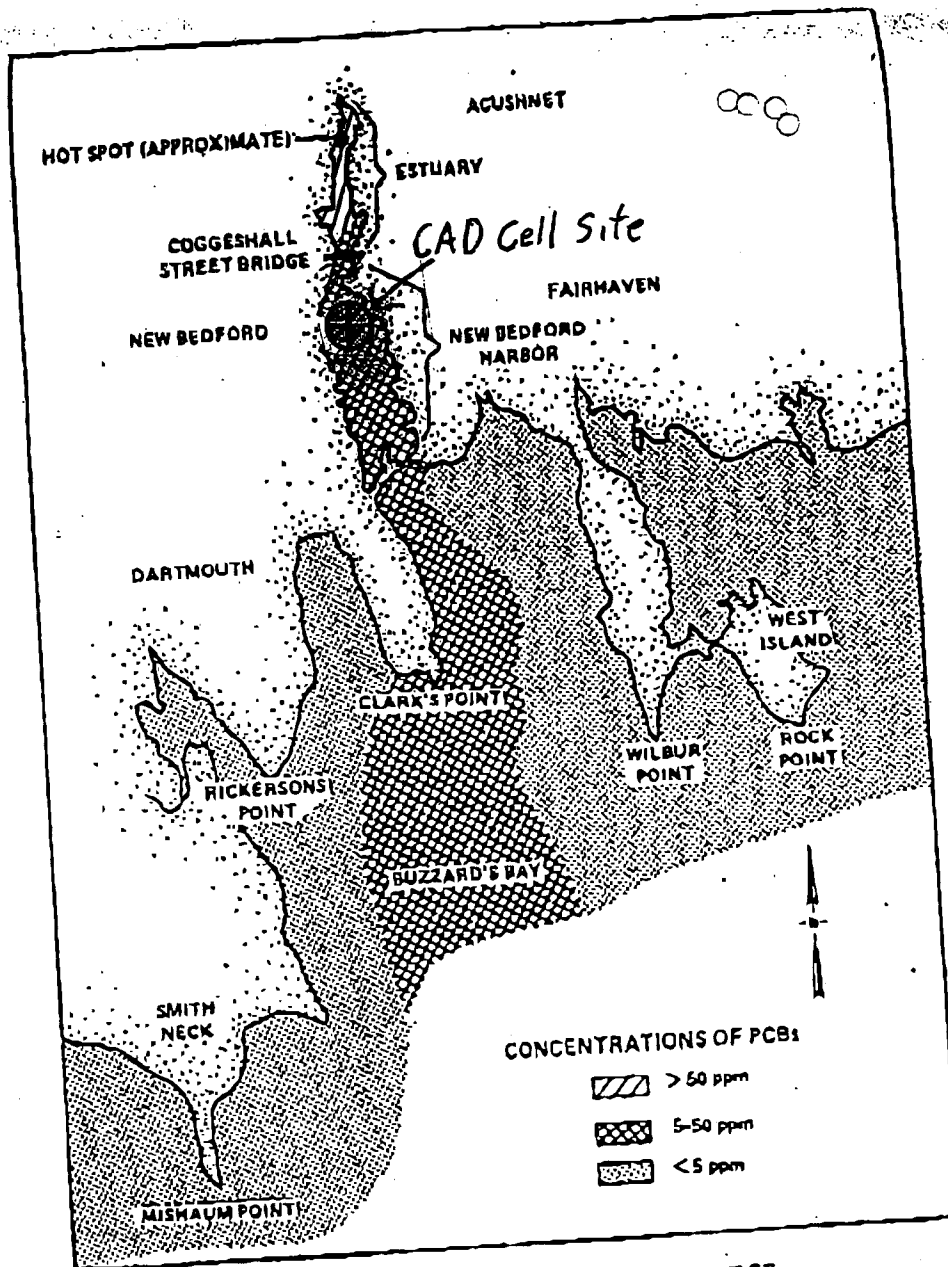


Figure 3. New Bedford Harbor PCB contamination (USEPA 1987)

- b. Dredging contaminated sediments and disposing of them in a partially lined containment site in the northern part of the estuary along the eastern shore.
- c. Same as option as b except that the containment site would be lined on the bottom, as well as on the sides.
- d. Dredging contaminated sediments and disposing of them in an upland containment site.
- e. Dredging contaminated sediments (which lay over clean sediments) and dredging clean sediments, temporarily storing both before returning the contaminated sediments to a specially constructed





Figure 2

Send To Printer Back To TerraServer Change to 11x17 Print Size Show Grid Lines Change to Landscape

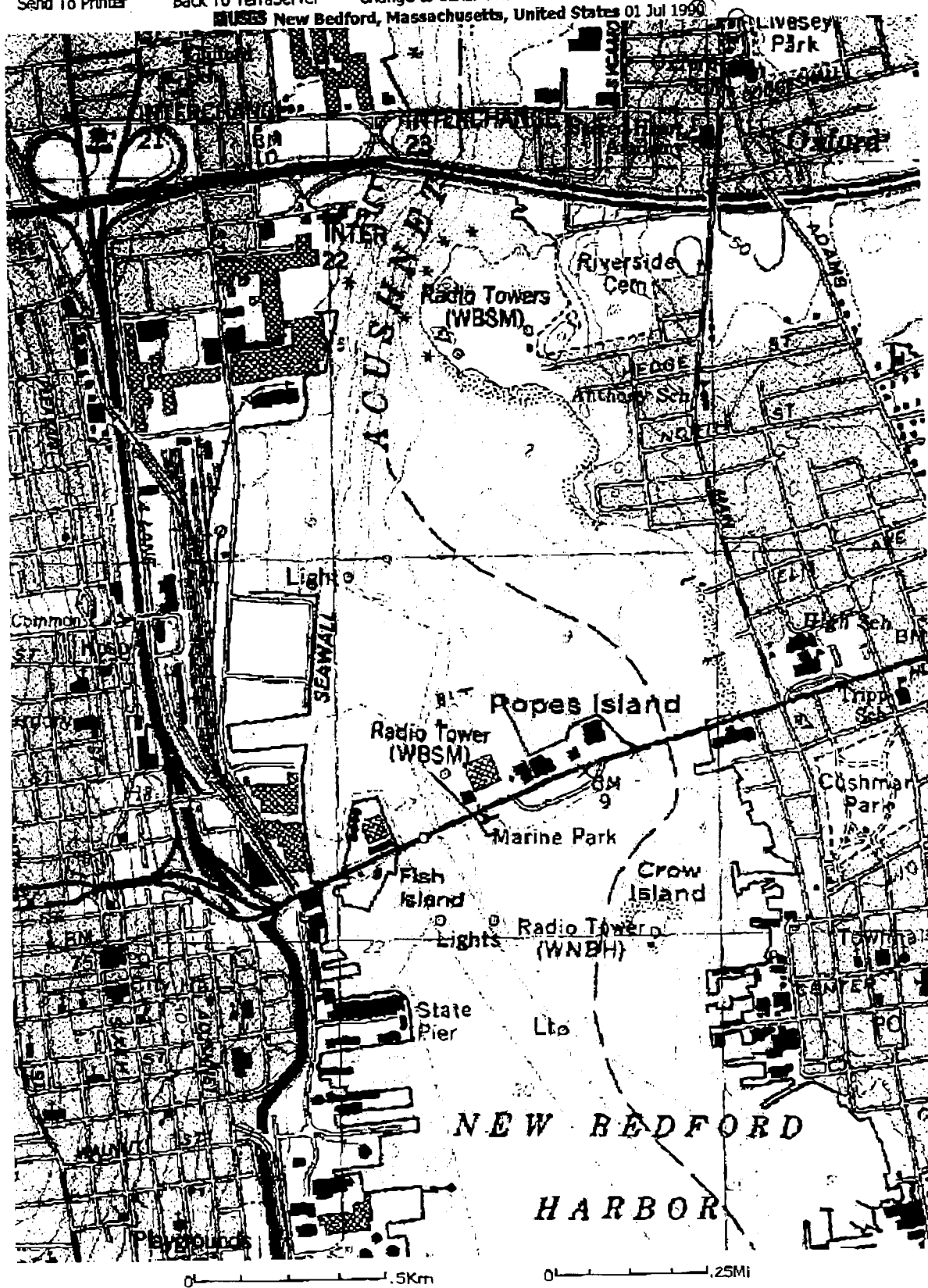
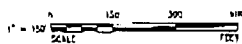


Image courtesy of the U.S. Geological Survey  
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PROJECT NO. 1504	DATE 05/78
DESIGNED BY	
CHECKED BY	
DRAWN BY	
SCALE: AS SHOWN	
SHEET NO.	

NEW BEDFORD HARBOR  
NEW BEDFORD, MASSACHUSETTS  
Popes Island North Side  
Candidate CAD Cell Configuration



**Maguire Group Inc.**  
Architects/Engineers/Planners  
225 Freshborough Boulevard  
Freshborough, Massachusetts 01906



DATE	TIME	DESCRIPTION
11/11/68	10:00	...



**APPENDIX B**

**The Model DMP**

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## Introduction

The Best Management Practices for confined aquatic disposal (CAD) of dredged material include a reference to development of a Dredging Management Plan (DMP). A DMP is nothing more than a detailed description of the dredging/disposal operation for a given project, i.e., the volume and quality of the material to be dredged, the equipment planned for use, and the overall schedule of operations. This document presents an example DMP for a fictitious project.

Specific guidelines for consideration in the development of the DMP are included in the text boxes.

Following the organization and content of the example will allow for the development of consistent DMPs. This is important for a CAD cell that may accept dredged material from multiple smaller projects.

The DMP should be included in the Environmental or Environmental Impact Statement for a given project, starting with the draft. It should be revised according to comments received during the review process. Following this approach will help assure that regulators have all the information needed to plan, approve, and manage the use of constructed CAD cell(s).

## List of Abbreviations

BMP – Best Management Practices  
CAD – Confined Aquatic Disposal  
cy – Cubic Yard  
DMP – Dredging Management Plan  
MLW – Mean Low Water  
WQC – Water Quality Certification



**Dredging Management Plan  
Harbor X Improvement Project  
August 23, 2001**

**I. Project Description**

**A. Objective/Overview** – The overall objective of the dredging project is maintenance dredging of the 25-foot approach channel into Harbor X and four berth areas as well as dredging of a new anchorage area. Some of the sediments to be removed have elevated levels of contaminants, and Confined Aquatic Disposal (CAD) has been selected as the disposal method. The project includes the following components which are shown on Figure 1:

- Maintenance dredging to remove shoals in approximately 2.5 miles of channel with a controlling depth of 25 feet (MLLW), removing approximately 100,000 cy.
- Maintenance dredging of four berth areas totaling 24,000 cy.
- Creation of a 25 ft (MLLW), 400 ft by 600 ft anchorage area, requiring removal of approximately 101,000 cy.

**B. Location** – Harbor X lies along a southern facing New England shoreline and is shown in Figure 1.

**C. Factors that Can Impact Operations**

1. Climate and Tide Conditions – Harbor X is protected from major weather impacts. Currents are generally 1 knot or less in the areas to be dredged and in the CAD cell area. Winds are generally from the west, perpendicular to the channel. The mean tide range is 8 ft, and the spring tide range is 9.2 ft.

*Climate and tide conditions at the dredging and disposal sites should be indicated in sufficient detail for reviewers and field personnel to understand risks and to determine equipment needs based on the work environment.*

2. Navigation Features

a) Navigation Traffic – The harbor contains a small port with limited commercial vessel traffic. Once every two weeks a container barge visits the port. The barge drafts 22 feet, arrives at high tide full and generally leaves empty. A bulk carrier carrying road salt visits seasonally and drafts 20 feet arriving at high tide. Visits are concentrated in the months from September through November averaging about two visits per week. During the winter season an oil barge calls on the port at least once every

two weeks with heating oil that supplies two storage tanks on the waterfront. One hundred commercial fishing vessels operate out of the harbor. Of these 60 are lobster vessels. Many of the lobstermen based in the harbor fish within the harbor that includes a part of the channel and the location of the CAD cell. There is also a large number of recreational vessels that transit the area with heaviest traffic during the summer season. Recreational traffic triples during special events such as the fourth of July and the annual yacht races held the first week of August.

*Any special navigation traffic issues should be indicated such as seasonal vessel movements and recreational traffic patterns that could impact the project schedule or impact routes used for dredging and disposal operations. This allows reviewers and contractors to estimate the project schedule and to determine communication requirements to minimize project interference with normal traffic.*

b) Navigation Obstructions or Hazards – There are no known navigation obstructions or hazards within the project area.

*If there are bridge movements required during construction, coordination with the operators should determine if there are any time restrictions or recommended times to reduce impacts on surface traffic. Bridges also should be reviewed for openings to assure that construction equipment can safely pass through. All pertinent bridge dimensions should be listed.*

c) USCG Restrictions – The USCG has special regulations that control traffic and use of the harbor. During the two special events (July 4<sup>th</sup> and the yacht races) there should not be any dredging traffic to or from the CAD or ocean disposal areas. More details of these and other harbor restrictions can be obtained by contacting the USCG.

*Close coordination with the USCG is required to determine what restrictions may be in effect in the area of dredging and disposal or along the proposed routes.*

3. Other Factors – All commercial berths that include dock facilities are subject to restrictions to prevent dock damage. The plans and specifications will provide details of restrictions for dredging at these facilities. Because a lobster fishing area is located in the project area there are seasonal restrictions to dredging and disposal operations. No dredging or disposal is permitted in this area during the months of March and April. During the period of June through September the contractor will follow the communications plan to notify lobstermen of planned activities in this area.

*Other factors that should be noted include the presence of shoreline or submerged structures (such as old bulkheads or cable crossings) that may be vulnerable to dredging or construction activity. Any special conditions required to protect these structures should be noted.*

**D. Dredging Depths** – Project depths vary and are listed in Table 1 for each project area.

**E. Material Characterization/Volume** – Table 1 shows the depths and volumes of material to be dredged from each area. This volume does not include an estimate of material to be removed to create the CAD (see Section IIC). Physical/chemical characterization of the unsuitable material is presented in Table 2.

**Table 1**

Project Area	Project Depth Ft (MLLW)	VOLUME			
		Suitable (cy)	Unsuitable (cy)	Rock (cy)	TOTAL (cy)
Channel	25	-	100,000	-	100,000
Berth 1	25	-	2,500	-	2,500
Berth 2	20	-	4,000	-	4,000
Berth 3	15	-	6,000	-	6,000
Berth 4	12	-	12,000	-	12,000
Anchorage	25	60,000	40,000	600	100,600
<b>TOTALS</b>		<b>60,000</b>	<b>164,500</b>	<b>600</b>	<b>225,100</b>

**NOTES:**

1. Volumes include overdepth allowances: 2 feet for suitable and unsuitable material and 3 feet for rock.
2. Estimates are based on in-situ conditions and do not include allowances for bulking after dredging and handling.
3. Suitable material will be disposed at the ocean site. All unsuitable material will be disposed at the CAD site.
4. Rock will be used by ACE construction company for use in road construction.

**Table 2**  
**Characterization of Material Classified as Unsuitable for Open-Water Disposal**

Project Area	Physical	Characterization of Unsuitable Material Mean Concentration mg/kg (dry wt.)				
		Copper	Lead	Mercury	PAH	PCB
Channel	Silt	142	204	0.51	3.6	1.8
Berth 1	Silt	166	228	0.48	7.2	2.1
Berth 2	Silt	147	214	0.43	4.8	1.4
Berth 3	Silt w/debris	230	332	1.1	38	122
Berth 4	Silt	138	197	0.62	3.1	1.8
Anchorage	Silt	109	127	0.38	1.7	0.8

In addition to dredged material it is estimated that 1 ton of debris will be removed. This material will be disposed in accordance with an approved debris management plan. In most cases large debris will be disposed at an approved upland site.

Unsuitable material is fine silty material with high water content. Suitable material is primarily consolidated clay with small isolated pockets of sand and gravel. There is one area of glacial till located in the northeast corner of the CAD located about –40 MLLW.

*The dredged material characterization and estimated volumes should be shown in tabular form for each area dredged. The material volumes should be broken down by the following main categories:*

*Material suitable for open-water disposal – Material within this category should be further broken down to include estimates on rock, gravel, sand, silt, and clay.*

*Material unsuitable for open-water disposal – Material within this category should include both a physical and chemical characterization.*

*Debris – Any significant quantities of debris should be noted and described in such detail that operational plans can be developed for removal and disposal*

**F. Disposal Volumes** – The volumes listed in Table 1 are based in bathymetric surveys of in-situ conditions in each project area. Final volumes will be computed using pre- and after-dredge surveys. In order to assure adequate capacity at the CAD, the volumes listed in Table 1 are increased by 30% to account for bulking or fluffing which occurs during handling of the material. This bulking factor is less than typically used for silty material but experience has shown that rapid consolidation in the CAD during and after disposal significantly reduces the impact. Based on these assumptions the CAD must have capacity for 214,000 cy of dredged material. The sizing of the CAD is further described in Sec. IIC.

The are no limitations on the volume of suitable material at the ocean site. The rock volumes meet the need for beneficial use.

## **II. Selection of Dredging/Disposal Methodologies**

**A. Alternative Methods Considered** – Dredging operations will be performed to assure that mixing of the unsuitable material and the suitable material is at a minimum level. In order to conserve space in the CAD cell for unsuitable material, the equipment used must have a dredge tolerance of less than 0.5 feet to avoid excessive overdredging into underlying suitable material. The equipment must be sized to dredge safely in and around the limited spaces in the berth areas. Due to the vessel traffic in the channel and berth areas, floating equipment must minimally impact normal vessel operations (being easily moved when required). The rock found in Berth 1 does not require blasting if a mechanical dredge with suitable bucket is used. Trash and debris expected will be removed by the on-site dredge. Turbidity control is required for dredging and disposal activities. Control of turbidity depends on the equipment used and the rate of dredging. Turbidity can be minimized in hydraulic dredges by minimizing swing speed and cutter

rotation speeds. Mechanical dredges can be fitted with closed buckets. Three types of dredges are readily available: mechanical; hydraulic; and hopper.

1. Mechanical – Mechanical dredging uses equipment such as clamshell dredges, dipper dredges, draglines, grab buckets as well as barge mounted excavators. The material removed by mechanical dredges is typically high in solids content. Material is usually placed in a scow or barge for transport to the disposal site. Mechanical dredges can leave an irregular bottom and typically generates high turbidity unless special closed buckets are used. Mechanical dredges are rugged and highly reliable and are capable of removing a wide range of materials including unconsolidated silts, consolidated clays, sand, gravel, trash, debris and certain kinds of bedrock. Mechanical dredges are able to operate in confined areas such as berths. Their production is low compared to hydraulic dredges.

2. Hydraulic – Hydraulic dredges operate using a solids handling pump to transport dredged sediments, as a slurry, through a pipeline to the disposal site. The slurry can also be pumped to a scow for transport to the disposal site. There are several variations in the design which include the very efficient cutter head dredge. Hydraulic dredges are capable of excavating a wide range of material but can not remove rock or certain debris. Turbidity is typically limited to the immediate vicinity of the cutter head. The pipeline from the dredge to the disposal site, if used, can be a navigation obstruction. There is also a limit to the length of the pipeline before it is necessary to include a booster pump. The slurry resulting from hydraulic dredging entrains large amounts of water resulting in water contents 3 to 5 times the in-situ levels. Management of this water may include treatment.

3. Hopper – Hopper dredges are self propelled floating vessels which include an integral suction pipe or several suction pipes which are dragged along the channel bottom. The dredged material is drawn through a suction head in the drag arms and passed through the suction pipe and centrifugal pump and deposited, as a slurry, in a large onboard hopper. After loading, the hopper dredge can sail to the disposal site and open bottom doors and discharge the dredged material. Some hoppers have the capability to off-load the dredged material by pumping. Hopper dredges are able to operate in sea conditions which would severely restrict the safe operation of other types of dredges. In addition, hopper dredges present a minimum interference to other vessel operations when working in busy channels and are able to efficiently transport dredged material over short haul distances. However, disposal requires that the dredging process be temporarily suspended as the dredge travels to the disposal site. Hopper dredges are typically more effective when dredging in deep channel projects and are not effective in restricted areas such as berths and docking facilities. They have high production characteristics when dredging loose alluvial soils and unconsolidated sands, but are severely restricted by stiff clays and similar bottom materials. Very fine silts are easily dredged by hopper vessels, but such materials do not readily settle in

onboard hoppers. This requires the dredge to carry only partial loads, with relatively high water content.

4. Rock Excavation Equipment – The project will include the removal of about 600 cubic yards of rock from the anchorage area. Specifications will allow the rock to be removed by mechanical means. There is a possibility that some rock will require drilling and blasting prior to removal. Prior to removal or drilling and blasting all overburden material will be removed by dredging. Drilling is typically performed by a series of barge mounted drilling rigs, which will drill bore holes of a specific diameter and pattern in the rock formation. The barge will require a small tug or push boat for maneuvering. The drill holes will be packed with precise quantities of explosive, which will be detonated in order to fracture the rock and facilitate removal. In order to remove the fractured rock or to remove rock that has not required blasting, a mechanical dredge equipped with a special rock handling bucket will be used. Because the blasted rock has planned beneficial use, it will be loaded into barges and transported to a shoreline off-loading site. If beneficial uses are not available at the time of construction, the rock will be disposed at the ocean site.

**B. Recommended Dredging Method** – Dredging will be performed by barge mounted mechanical equipment. This equipment will provide continuous and reliable service for the duration of the project. The mechanical dredge can be fitted with different types of buckets to optimize dredge production in the various materials which will be encountered. This plant will be capable of operating in both the open channel sites as well as within the restricted berth areas. Dump scows will be used for hauling and placement of dredged material. Scows will also be used for temporary storage of silts during initial phases of construction, while the CAD is under construction. Hydraulic or hopper dredges are not recommended for a number of reasons. The hydraulic dredge was not recommended because it would require a long pipeline system which would be a potential navigation obstruction. There is no readily available area for construction of a facility to dewater maintenance material and manage the high volumes of entrained water. Hopper dredges are not recommended because of the restricted operating areas in the berths and the anticipated difficulty of dredging consolidated improvement material including the rock.

1. Equipment :

- (a) Dredge – Due to the size of the project it is anticipated that only one dredge will be used. The barge mounted mechanical dredge will require between 1,500 and 2,000 horsepower.
- (b) Dredge Buckets – Optimal production will require the use of as large a bucket as possible. Bucket size and type depend upon the available power on the dredge and the type of material being dredged. Unsuitable silty material will be dredged using a sealed “environmental” bucket with a capacity of 15 to 22 cubic yards. The bucket will have no teeth that could easily penetrate into the improvement material, will be designed to reduce sediment loss during

closure, and seals to minimize loss of fines as the bucket is drawn up through the water column. Suitable improvement material will be dredged using a standard open bucket. Heavy duty open rock buckets will be used to dredge rock or to remove rock after blasting. Daily production rates using these buckets are estimated to be: 4,000 cy for unsuitable maintenance material; 8,000 cy for suitable improvement material; and 500 cy for rock (fractured or blasted).

- (c) Scows and Barges – Scows (bottom-dump or slit hull) and barges will vary in size depending upon availability and location of the dredging operation. Scows typically range from 500 cy to 4,000 cy. It is likely that the smaller scows will be used in the berths and larger ones for channel work. It is anticipated that a minimum of two scows will be used. It is likely that additional scows will be mobilized as needed for temporary storage of maintenance material during CAD construction and as backup in case repairs are needed. The scows will be moved by tugs with on-board power of around 1,500 hp for disposal in the CAD site. Tugs for use in ocean disposal would require about 3,000 hp.
- (d) Other Equipment – Typical equipment needed to support the operations may include a fuel barge, maintenance barge, a small work tug to assist in moving the dredge and scows. Also, if blasting is required a drill rig and associated equipment described above will be used.
- (e) Operational Controls – The dredging operations, including the required drilling and blasting, can be managed sufficiently to minimize associated environmental impacts. The primary objective of defining and implementing operational controls is to minimize sediment resuspension throughout the dredging and disposal process while maintaining operational efficiency. Drilling and blasting, if needed, present an additional control challenge. Resuspension of sediments could impact the shellfish beds and the lobster fishing areas. Control of dredging operations is covered in detail in Section III.

*The selected alternative should be described in detail including the following:*

- *Specific equipment to be used;*
- *Number of dredges expected;*
- *Expected production rates; and*
- *Equipment proposed to reduce environmental impacts.*

**C. Recommended Disposal Method** – Based on environmental studies and financial considerations, disposal of unsuitable material will be in the designated CAD site located in the channel and shown on Figure 1. Disposal into the CAD will be from bottom dump

scows. Suitable improvement material and rock, if no beneficial use is found, will be disposed at the designated ocean site using bottom dump scows.

The CAD cell will be sized to accommodate all unsuitable material from the project (214,000 cy, see Sec. IE), space for a three foot thick cap and additional headroom space to prevent spill over during disposal. The total space above the disposed material could be up to five feet (including the three-foot cap). The total volume of material that must be excavated to create the required CAD is estimated to be 260,000 cy. The footprint dimensions of the cell will be determined by the scows that will be used, and the allowed depth and side slopes based on geotechnical studies.

The contractor will have the option of changing the dimensions of the CAD and will be encouraged to increase the depth if equipment capacity and geotechnical conditions allow it. The only restrictions in dimensions is that the width may not exceed channel width of 250 feet and the southern limit can not be extended into the lobster fishing area. Design studies indicate that the material to be excavated from the cell is primarily clay with sand and gravel pockets and one area of glacial till. This material could support excavated side slopes of 1V on 2H. All material to be excavated from the cell is suitable for disposal at the ocean site or available for beneficial use. There is no bedrock within the expected depth of the cell. However, the northern third of the cell may have glacial till about 20 feet below the bottom of the channel. The CAD footprint that would accommodate this criteria would be 250 X 1,000 feet. The depth below the authorized channel bottom would be about 50 feet. The contractor will perform subsurface explorations, geotechnical analysis and submit a cell design for approval.

*In some cases, where there are structures close to the cell location, the cell geometry may be governed by stability requirements. The results may limit the depth of the CAD or its location.*

**D. Drilling and Blasting (if required)**- It is anticipated that the project rock can be removed by the mechanical dredge.

**E. Capping (if required)** – Based on state requirements, the disposal cell will be capped with a minimum 3 feet of medium to coarse sand. The contractor will be required to submit a capping plan which will identify the source and physical properties of the capping material to assure compliance with all technical and environmental requirements.

III. **Dredging/Disposal Operations** – The dredging operations require close coordination with the proponent, all berth owners, harbor master, Coast Guard, the contractor, environmental resource agencies, fishermen and lobstermen. It is anticipated that the dredging and disposal operations will take about 8 months to complete. Dredging can be performed any time of year and will be a 24-hour, 7 day per week operation except for restricted periods for lobster fishing and two special events as described in IC. A general schedule of operations is shown on Figure 2.



**A. Mobilization** – Prior to initiation of dredging, a number of preparatory tasks must be completed. In addition to equipment movement into the area, there are contract requirements for submittals which require approval before work may commence. Included in these required submittals is the inspection of equipment to assure it is safe and fully functional and meets all environmental protection requirements. The completion of these tasks will set the foundation for the efficient execution of the contract work.

*It is important to include any unusual requirements beyond the normal mobilization process.*

1. Upland Support Requirements – Dredging operations require upland support area(s) with direct access to the harbor. Berth 2 has sufficient area to provide parking for the workers, project trailer space, an equipment storage area and docking facilities for marine transport for workers, survey boats, tugs and other craft.
2. Structural Evaluation – Prior to dredging or blasting operations, a detailed survey of existing infrastructure will be performed. This survey will include a review and documentation of the harbor structures that may be impacted by the proposed activities. The location of critical structures will be determined and recorded. Structure condition will be described and a photographic record made. Pre-project conditions will be clearly identified. A condition report of each structure will be prepared by the blasting contractor and provided to each facility owner prior to any construction activities. A survey of the channel and berth areas included within the project bounds will be performed to identify and locate all submarine utilities. The survey will encompass a review of record drawings maintained by utility companies. The survey will identify the location of all utility elements and will identify specific means for protection or relocation during dredging and/or blasting operations.
3. Regulatory Constraints – All construction activities will be performed under the conditions established in permits issued for the work. These conditions may identify specific environmental performance criteria which must be satisfied.
4. Seasonal Limitations – The only known seasonal constraint is associated with the lobster fishing area. No dredging or disposal is permitted during the months of March and April or July through October 15. During the period of May and June the contractor will follow the communications plan to notify lobstermen of planned activities. Disposal is allowed during these periods after following communication protocols.

**B. Dredged Material Handling** – The proper handling of dredged material will assure that potential impacts to the environment are minimized.

1. Monitoring Requirements – During dredging and disposal operations, activities of the contractor will be observed by a CZM inspector and construction management team. In addition to monitoring and verifying the dredge position, surveys and quality control, the team will also assure compliance with required permit conditions. Because of the sensitivity of the surrounding environmental resources to both dredging and disposal operations, this project will include the required independent observer. The independent observer will coordinate closely with the construction team and contractor to assure that permit conditions are met. The independent observer may facilitate meetings to resolve unexpected issues that may require amendments to permits. However, the observer may not direct contractor operations.

2. Environmental Bucket – Dredging of unsuitable soft material will be performed with a closed “environmental bucket as described in IIB.

3. Standard Bucket – Dredging of suitable material, including removal of fractured rock, will be performed with standard open buckets.

4. Scows – Standard bottom-dump or split hull scows will be used to transport dredged material from the dredging site to the disposal locations. All scows will be inspected prior to use to assure that no leakage will occur. During filling operations, no overflow of water will be allowed. Periodic inspections during the construction period will assure that water tightness of the scows is maintained. During the initial construction of the disposal cell, the unsuitable material removed to expose the CAD will be stored temporarily on a scow until the cell has been completed. Extra precautions for assuring the scow remains tight and docked securely will assure that this one-time storage does not cause release of the sediments prior to disposal.

**C. Dredging/Disposal Sequencing** – The first operation is a complete pre-dredge survey required for payment purposes and also to track dredged volumes of each type of material. The next phase will be any baseline or pre-dredge monitoring required. Construction will begin at the disposal cell to remove unsuitable material down to suitable material. Unsuitable material will be temporarily stored as described above. Once the disposal cell footprint is exposed and a bathymetric survey is taken the cell will be excavated to its full dimensions. Progress surveys of the cell will be taken to assure that capacity requirements will be met. With only one disposal cell available for the project, cell capacity is critical. After the final survey indicates that the cell has sufficient capacity, the stored material will be disposed. From this point until all dredging is completed the sequence of dredging and disposal of unsuitable material directly into the cell will be maintained. In some cases the dredge bucket can be changed to dredge suitable material once the overlying unsuitable material is removed. Periodic bathymetric surveys will be performed for progress payments but at least at the end of each category of dredging.

1. Site Prioritization – After completion of the disposal cell, dredging will follow the following sequence listed in order of priority. This sequence may temporarily change in order to avoid conflicts with vessel passage or berthing traffic.

- a) **Unsuitable Material** – One of the environmental objectives is to sequence the disposal of unsuitable material into the disposal cell in order of most contaminated first and least contaminated last. The following sequence meets that objective:
  - (i) Berth 1 – The unsuitable material in this berth has the highest level of contamination and will be first in the cell.
  - (ii) Berth 2 – This berth has the next highest contamination level and will second into the cell
  - (iii) The channel downstream of the cell has moderate levels of contaminants and will be placed next in the cell.
  - (iv) Berths 3 and 4, the anchorage, and the channel upstream of the cell have the lowest levels of contamination and will be placed last.
- b) **Suitable Material** – The anchorage area is the only location of suitable material.

**D. Capping** – The CAD for this project requires capping. The 3-foot thick cap will fully contain the disposed material and protect the site from propwash from vessels transiting the site.

1. Materials – The medium to coarse sand required by the state is compatible with the unsuitable material once the dredged material has consolidated to an acceptable level.

2. Potential Sources – While no specific source for the capping material has been selected, there are several potential sites that the contractor has available. There are two upland quarries that could supply river run sand. The preferred source would be from a water site such as a dredging project. Experience has shown that wet marine sand works better than dry sand during handling. The contractor will search for potential dredge material sources for capping material before seeking upland sources.

3. Consolidation of Dredged Material – A minimum consolidation time of two months will be used. Time will begin with the last disposal event into the CAD. Monitoring of the material may indicate that more or less consolidation time is needed. At this time there are no standard methods to determine readiness to cap, but simple field observations and bathymetric surveys provide indications when the initial rapid consolidation is complete.

4. Placement Methods and Controls – There are several methods of placing capping material. In all cases the equipment used must place the material gradually while in motion. Possible methods are: split hulled scow, hopper dredge, and pipeline. Monitoring during placement will be required to assure that minimum cap thickness is attained and that excessive cap thickness is avoided. Caps will be placed in complete layers until the required thickness is met

**E. Communication** – All communications will be copied to the project team. Communication protocol will be described in an approved Communication Plan. The following parties require specific communications on a routine basis or for specific reasons. These requirements are may be modified to accommodate permit requirements:

- US Coast Guard
- Harbormaster
- Morin Lobstermen's Association
- Fishermen's Association
- Recreational Boat Club

**F. Operational Controls** – During construction and monitoring the project construction team and other personnel will assure that the project meets safety and environmental requirements. Contract documents will clearly define levels of responsibility and lines of authority for the CZM, the contracting officer and the contractor. The contracting officer will be responsible for implementing all terms of the contract and for assuring that all conditions of all project permits are met. The contracting officer may designate various experts to assist with contract administration. This assistance may include licensed surveyors, on-board inspectors and specialists in environmental services. The contracting officer is the only person with authority to modify the contractor's work. The independent observer will have full access to the site and will be responsible to the resources agencies for status reporting and permit compliance.

**G. Operations to Reduce Impacts** – In addition to using the environmental bucket to reduce suspended solids during dredging, disposal will be limited to high slack tide (plus 2 hours) to reduce the turbidity plume concentration to meet state requirements. If monitoring shows that disposal during other tidal ranges can meet the water quality criteria, then a change may be requested. If suspended solids reach exceed limits at the disposal cell, dredging will be shifted from unsuitable to suitable material until turbidity at the cell area returns to acceptable levels. If there are reasons to move out of one area to avoid environmental or vessel traffic problems, the contracting officer will coordinate changes with the contractor.

**H. Monitoring** – Monitoring is planned as specified in the Water Quality Certification.

**I. Mitigation Measures** – No mitigation measures have been identified for this project. If permits require mitigation, then this plan will be amended.

**J. Volume Calculation** - Final volumes of dredged material will be computed using the pre-and after-dredge surveys for payment purposes. In order to meet the permit requirement for an estimate of volume actually placed in the disposal cell, additional surveys will be performed during cell filling. Because bulking of the material is expected from handling and rapid consolidation of the material is expected within the cell, these estimates will be based on several assumptions. To assist in this effort, the contracting officer will record all scow movements and estimate volumes based on scow drafts before departing for disposal.

IV. **Contingency Plans** - Due to the complex nature of dredging and disposal operations, equipment reliability, vessel traffic, weather and other factors unique to construction on the water, it is necessary to be prepared for potential unforeseen impacts on schedules and costs.

*Having contingency plans prepared and approved before construction is in the best interest of the proponent and the regulators and should avoid unnecessary delays during construction. While it is impossible to predict all the possible situations that would require contingency plans and how to deal with them, there are situations common to dredging projects that can be predicted.*

Contingency plans will be prepared for the following:

**A. Project Delays** – Prior to project construction, the contractor will be required to submit a detailed schedule of operations for the entire project. This schedule will accommodate all known weather, seasonal environmental restrictions and vessel traffic situations. This schedule will be approved by the contracting officer with input by others.

The contracting officer will monitor the progress of the schedule. Any prolonged delays which could impact critical milestones will activate a contingency plan. The cause of the delay will be critically reviewed and procedures implemented to reduce delays. To assure that contractor delays will not be extended and potentially threaten completion of the project, the contracting officer will have the authority to require the mobilization of additional equipment and personnel as required. The contractor will be obligated to provide the necessary resources at its cost within the established time table. If the delay is caused by unforeseen weather phenomena, impact from a non-project condition or other uncontrollable condition, the contractor will be required to add resources but at no additional cost to the contractor.

**B. Operations Issues** – If changes to the sequence of dredging and/or disposal are required, there should be a plan that will continue to meet all requirements. There should be measures in place if unexpected types or volumes of dredged material are encountered.

1. **Operator Qualifications** – It is essential that the dredge operator understand the unique requirements of the project. Experience in operating closed buckets, regulating bucket impact and haul speed to minimize turbidity is critical. The contracting officer will contractually require the contractor to employ dredge operators with demonstrated exemplary skills. The contracting officer will reserve the right to replace any operator that does not meet minimum skills or does not demonstrate an ability to satisfy the performance requirements of the project.

2. **Disposal Operations** – Due to the uncertainty of disposal cell construction, operations and capping only a modest change in any of the factors governing cell capacity could require alternative disposal plans. Because any anticipated contingency needs would be small, upland disposal at a local landfill is feasible. For the situation where turbidity limits are exceeded at the cell area, operations

could be shifted to suitable material or other operations not requiring use of the cell. Also, permission may be requested to dispose during other tidal conditions with appropriate monitoring.

*There may be weather or permit related reasons for delaying or halting disposal operations at all sites or specific sites. The contingency plan should describe what temporary operations may take place if this were to occur. In some cases the project may shut down entirely. Reviewers should understand the consequences of changes to disposal operations.*

**C. Permit Conditions Exceeded** – As described previously, project operations may be shifted in location or rescheduled in order to meet permit conditions. As the project progresses the options for moving the location or schedule becomes more limited.

*The plan should identify possible measures to be taken if permit conditions are temporarily exceeded. Changes in timing and location of operations should be considered.*

**D. Equipment Failure** – As described previously, the contracting officer may require the contractor to mobilize the equipment necessary to maintain the approved project schedule. In some cases the contractor may be able to shift from one type of operation to another to allow for repairs. However, if the dredge itself requires shutdown for repairs, all dredging stops. The contracting officer may require mobilization of another dredge if dredge shutdown is prolonged. The contractor's contingency plan should identify availability of other equipment or subcontracting options. Any use of substitute equipment must be approved by the contracting officer.

**E. Environmental Conditions** – There may be changes in environmental conditions which may require changes in operations. These may be seasonal such as unforeseen movements of fish or lobsters into impacted areas. The contingency plan will include options for changing project operations including contracting of fish observers or other environmental specialists who are qualified to monitor environmental problems and recommend solutions that meet permit requirements or fishermen's needs







**APPENDIX C**

**The Model BMPs**

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## Introduction

This document presents Best Management Practices (BMP) for confined aquatic disposal of dredged material that is unsuitable for unconfined open water disposal. For the purposes of this document, confined aquatic disposal (commonly referred to as CAD) involves disposing the dredged material entirely within the aquatic environment, and sequestering it by placement within constructed cells or natural depressions on the bottom of harbors, bays, or other coastal environments. The specifics of CAD management may vary significantly from project to project, depending on the following factors:

- Will the CAD area be sited or constructed for a single project or will it be used by multiple projects over more than one dredging season?
- What type of equipment will be used, how much material will be dredged/disposed and at what rate?
- Is capping of the CAD cell or area required after disposal is completed?

This set of BMP has been developed to cover constructed CAD cells and is based on experience from the Boston Harbor Navigation Improvement Project (BHNIP) and review of other related projects. Relevant aspects of the BHNIP are included in the text boxes throughout the BMP.

This BMP covers the following project phases related to constructed CAD:

- Planning
- Design
- Construction
- Disposal into CAD Cell
- Capping
- Monitoring (included in multiple phases)

A key companion to the successful implementation of BMP for constructed CAD is the development of a Dredging Management Plan for each project that will use a given CAD cell. The Dredging Management Plan will supply the necessary detail to allow proper interpretation and application of practices related to CAD.

## List of Abbreviations

BHNIP – Boston Harbor Navigation Improvement Project  
BMP – Best Management Practices  
CAD – Confined Aquatic Disposal  
DMP – Dredge Management Plan  
MLW – Mean Low Water  
WQC – Water Quality Certificate

## I. **Planning**

The planning step allows for a general assessment of the feasibility of CAD within a given area. This step also supplies the information required for a preliminary cost estimate for CAD as well as the input for the actual design of CAD cell(s) for a given project.

### ***A. Determine the Required Capacity of CAD(s)***

1. Estimate the volume of dredged material to be placed into the CAD cell(s). The uncertainty associated with the projection method (bathymetry, geophysical methods, coring, etc.) should be considered in providing for a capacity contingency factor.
2. Estimate the potential bulking and consolidation of material to be placed. For a large project, this may include collection of samples and performance of laboratory tests. For a smaller project, literature values can potentially be used. Knowledge of the material handling methods (dredging and disposal) is critical to an accurate bulking estimate. A projection of the potential filling schedule is as important as the post-disposal consolidation phase in estimating overall consolidation.
3. Estimate accumulation from sediment transport into the cell over the time it is open if it is located in a depositional zone (could potentially result in capacity reduction).
4. Estimate an overall contingency factor for cell capacity. This includes the estimates from numbers 1-3 above as well as other project-specific factors. Is there only one CAD cell to be open at a given time? If so, can the project schedule accept potential delays if the cell is shut down because of temporarily reduced capacity associated with short-term bulking of disposed material or for other reasons? Will the cell be nearing capacity at a time of year with increased frequency of storms that may limit the height to which material is filled within the cell?

### ***B. Select Potential CAD Area***

1. Potential areas for locating CAD cells should be shown on a map or chart in relation to the proposed dredging locations with a goal of minimizing the transport distance. If possible, the information should be shown in GIS so that the other relevant information can be presented as individual data layers.
2. Determine any seasonal or environmental restrictions on cell construction, disposal events, or cell capping. Consider restrictions that may be placed on vessels transiting away from the site during construction (potentially transiting to

an offshore disposal site) or on vessels transiting from the dredging area to the CAD site.

3. Locate all environmentally sensitive areas or areas with special protection relative to the CAD site and within any potential routes between the dredging sites and the CAD. These areas should include known fisheries and lobster areas.
4. Determine if any hydraulic issues, i.e., currents, propwash, nearby intakes or outfalls, exist in the area. Locate the CAD site in as low an energy area as possible.
5. Evaluate potential impacts on nearby structures.
6. Determine if any navigational restrictions exist in the area or within potential routes between the dredging sites and the CAD. If sites are to be considered within the navigational channel, additional assessment of hydraulics (prop wash) and restrictions (no spud zone, future depth limits) must be included.
7. Locate CAD sites away from areas that require bridge openings if possible.

### ***C. Perform Preliminary Layout of Specific CAD Sites Within the Designated Area***

1. Determine if there will be multiple CAD cells within the designated area. If so, assess the benefits of keeping them close together (ease of management/monitoring) vs. operational constraints if nearby cells are in use concurrently. Multiple cells offer the advantage of flexibility. If one cell is not available (because of a water quality exceedence or excessive bulking, for example), the other cell can be used. Note that if multiple cells are too close together, a constraint on one cell could affect operation of the adjacent cell.
2. Consider the potential long-term habitat changes resulting from the cell(s) in the designated area.
  - a) Final disposed material or cap may be different substrate than the surrounding area.
  - b) Planned incomplete filling of a cell (to avoid loss of disposed material) coupled with consolidation over time may result in the cell being depressed below the surrounding area with potential deposition and water quality issues.

### ***D. Assess Capping Requirement***

1. Assess the regulatory requirements associated with capping. Specific requirements may focus the physical/chemical assessment in number 2 below.

- a) Is the requirement for a cap absolute and, if so, what are the thickness requirements?
  - b) Are there time requirements associated with how long a cell can remain open or in the consolidation phase? Note that an extended consolidation phase increases the likelihood of a successful cap. Is an interim cap required if a cell is open more than one dredging season?
2. Perform a qualitative assessment of the potential impacts to human health and the environment associated with the CAD cell that focuses on the potential for exposure to contaminants.
    - a) Define the physical-chemical characteristics of the contaminants of concern associated with the dredged material destined for disposal.
    - b) Compare the characteristics of the contaminants in the disposed material with that in the surrounding vicinity of the proposed CAD cell(s). The comparison should include both concentration and aerial extent and note if concentrations are expected to remain constant over time.
    - c) Determine the potential for groundwater transport through the cell(s) (distance from shore, type of native material, relief along shoreline, aquifer structure). For coastal New England, this is generally not a major concern.
    - d) Assess the potential loss from the cell(s) due to vessel passage and storm events. This can range from a general overview based on cell location to performance of hydrodynamic modeling.
    - e) Determine the natural deposition rate expected over the cell after completion.
  3. Perform a quantitative risk assessment if required.
  4. Cap Specifics
    - a) Determine the physical characteristics and amount of cap material that would be required (grain size, thickness, bulking/consolidation factors, overall volume).
    - b) Assess the feasibility of cap placement (source of cap material, accessibility of equipment during cap placement)

**E. Prepare Guidelines for Use** – Setting guidelines for use of the CAD cell(s) will help to focus the specifics of design.

1. Set limits on the type material to be disposed, including both chemical and physical properties. The limits may vary over the life of the cell, such as disposing more contaminated material deeper within the cell.
2. Set limits on equipment to be used for dredging. The physical properties of the dredged material are impacted by the method used to dredge them. Mechanical or clamshell equipment would be the most likely used for smaller scale harbor projects and is also the method least likely to cause adverse changes in the physical properties of the material. Other methods such as hydraulic dredging entrain more water and increase bulking, lengthening consolidation time and potentially reducing cap performance.

Within the mechanical methods are the specific bucket designs and capacities. The objective is to reduce water entrainment by using buckets that are not oversized. Usually contractors size their buckets for fill efficiency based on depth or face expected. Fortunately, this also results in minimal water entrainment. The adverse impact of using closed or environmental buckets, which capture more water, have to be balanced by the positive reduction in turbidity at the dredging sites.

Preliminary results from the Boston Harbor Navigation Improvement Project indicate that closed buckets do not have a significant positive reduction in the turbidity at the dredge site compared to conventional open buckets. Some researchers believe that use of closed buckets increases water content which increases consolidation times in the cell and may compromise cap integrity.

The equipment needed to dredge the cell may be different than that used to dredge the unsuitable material. Larger and heavier buckets will likely be used. If side slope stability requires a slope then stair stepping will be needed. This requires a well-planned construction sequence particularly if deep cells are used. Safety becomes an important issue when spuds are used near the slopes. Boom reach and swing angles are factors. These issues may determine the shape and final size of the cell opening.

3. Set limits on the equipment used for disposal. With mechanical dredging, split-hulled or bottom-dump scows will likely be used for disposal. The size and general condition of the scows can vary widely. Water quality issues may necessitate requiring a watertight scow. Alternate methods exist for direct placement of material into the cell. These may result in reduced impact to the upper water column, but will significantly extend the length of the disposal operation and may result in additional bulking of the disposed material if pumping is used.

4. Set limits on schedule of disposal. This includes the specific timing, such as tidal (slack tide) or weekly (non-weekend) or seasonal (non-migratory) components. It also includes consideration on the overall rate of disposal.

5. Define the general monitoring requirements during disposal.

## II. Design

The design tasks below assume that an area has been selected for construction of one or more CAD cells. The most important effort in cell design is to determine the geometry required to meet disposal capacity requirements. It is recommended that the plans and specifications for cell construction leave as much room as possible for contractor design and layout. This allows for optimization of cell design, layout, and operations considering the equipment and other resources available to the selected contractor.

**A. *List the Relevant Design Criteria*** – A list of the relevant design criteria should be developed prior to the start of any fieldwork. This list should include:

1. **Maximum Depth** - The maximum practical cell depth is a function of cell material as well as the equipment that will be used to dig the cell. Most mechanical dredging barges that work off spuds can dig up to about 100 feet below MLW. Safety of the equipment at these depths has to be considered. In order to construct the deeper cells, dredges have to set up, dig, and then back up for the next reach, always moving backward rather than forward. This means that once the spud limit is reached no further dredging can be done in that area unless it is safely within arm's reach from the edge of the cell.
2. **Side Slope Stability** – Side slopes may also affect the maximum practical cell depth since the side slopes may converge before a desired depth is reached. This in turn may require a larger cell footprint to reach needed capacity.
3. **Distance from Structures** – If the cell is planned to be near existing or future docks, piers, navigational aids, etc., a formal geotechnical analysis may be required to determine an adequate safety factor on the slopes and distances adjacent to structures. The potential for impacting underwater or buried utility crossings should also be evaluated.
4. **Subsurface Investigations** – Subsurface investigations should include a boring program at a minimum. Geophysical methods (acoustic and seismic profiling, radar, sidescan sonar, etc.) can be used to extend the boring program. The sub-bottom profiling is a requirement if hard digging or rock is expected anywhere in the cell area. Sufficient coverage around the proposed cell site should be accomplished to allow for realignment or other changes that may be needed to accommodate the capacity requirements.

**B. *Assess Other Factors that Affect CAD Capacity***

1. **Natural Sediment Transport** - Another factor that may reduce capacity is accumulation of material from tide currents, propwash etc. that may occur while the CAD cell is open. The open cell will trap any material that normally moves



along the bottom. This potential accumulation should be estimated from existing data and may not be a major factor for cells open a relatively short time.

2. Overflow Concerns – If there is a desire to end up with a completed cell flush with the surrounding area, some loss of material from the cell during the latter stages of disposal may occur (as the cell is nearly full). Alternatively, cap thickness could be increased to “fill” the cell to the top.

3. Single Cell - If only one CAD cell is available for each dredging project, a significant contingency factor must be included in setting the cell capacity. There will be no alternative disposal sites in case there are any restrictions or delays in disposing in the open cell because of excessive bulking of the previously disposed material. Underestimating capacity could result in major delays and limitations on dredging.

BHNIP – During the final disposal rounds into one of the first cells in the BHNIP (a relatively small cell), the contractor discovered material outside of the cell following disposal (based on pre- and post-disposal bathymetry). As all of the disposal events were determined to have taken place over the cell (no “misses”), it was assumed that the material overtopped the cell in the form of an internal wave during disposal. The contractor subsequently set a limit to the fill depth within the cell of approximately 8 feet below the top of the cell.

### ***C. Assess Material to Be Removed from CAD Cell During Construction***

1. Unsuitable for Open-Water Disposal – If construction of the cell requires removal of material that cannot be reused or disposed at an open water site, provisions need to be made for the safe storage of that material until the cell is completed or for disposal via alternative (upland) methods. Note that if the material is stored aboard a scow, that scow should be inspected prior to use to ensure an adequate seal.

2. Suitable for Open-Water Disposal – If the material removed from the cell during construction is suitable for offshore disposal, beneficial reuse should be explored. Reuse of the material as an interim or final cap should be considered.

### ***D. CAD Cell Design Specifics***

1. Optimize Number of CAD Cell(s) – Fewer, deeper cells are generally more efficient than larger number of shallower cells in terms of construction and in management of the cells after closure.

2. Cell Spacing – If multiple cells are considered, side slope stability will dictate a minimum distance between cells. This separation distance should also be evaluated in terms of the equipment that may need to access a cell from its boundary (sufficient space for anchors/spuds).

3. Optimize Cell(s) Open Area – The surface area of a cell that is open should be optimized based on several factors. The type and size of the equipment used for constructing the cell, the equipment used for disposal, and the equipment used for cap placement should be considered. In general the long axis of the cell should be in line with currents to aid in navigation over the cell and to help limit transport of suspended solids from the cell. If possible, the size should be such that the capping equipment can place one layer of material over the entire cell during each cap placement.

4. Future Use - If any cell is proposed to be located within an area that is anticipated to require dredging in the future such as a navigation channel or anchorage, several major restrictions will limit its navigation uses. The top of the cell cap will limit future deepening. The top of cap must be set below future dredge depths plus a reasonable overdepth of at least two feet. Cells should also be clearly shown on navigation charts as no spud zones and no anchor areas.

### ***E. Cap Design***

1. Material - The cap material must be compatible with the disposed material, i.e., not of a form or density that results in the cap material displacing the disposed material. The cap material must also withstand erosion from currents, wave action, and propwash expected for the area.

2. Thickness - Cap thickness must be sufficient to meet the overall capping objectives: preventing erosion, biological penetration, and/or chemical migration. If sediment accumulation over the cell (self-capping) is projected to be rapid enough, consideration may be given to a thinner cap.

3. Configuration – The final configuration of the capped cell must be clearly identified. If the capped cell is required to be at a specified elevation (flush with surrounding area or within a specified depth), multiple capping sequences may be required.

4. Consolidation Time - The maximum allowed consolidation time prior to capping must be determined as this can impact the sequence of capping events and the amount of capping material required (assuming some mixing with initial capping layers).

BHNIP – The required cap thickness was set at three feet (one foot potentially mixed with disposed material and two feet clean cap). This thickness met the biological and chemical criteria and was also a practical thickness to construct and monitor underwater.

### **III. Operations**

#### ***A. Construction Phase***

1. Once cell construction begins there must be close quality control to assure that cell capacity is maximized and safety is maintained. This requires multiple bathymetric surveys with sufficient resolution to determine the interior dimensions of the cell for capacity calculations and slope stability confirmation. High-resolution multi-beam surveys are recommended. Periodic surveys will also detect sloughing of material off side slopes and material moving into and trapped in the cell. The final survey immediately before disposal will be used to compute the total capacity and remaining capacities during the filling process.
2. Monitoring may be required during cell construction dredging to assure that any overlying contaminated sediments (which may be held for disposal into the completed cell or disposed elsewhere) are adequately removed prior to dredging of underlying clean material. Storage of any contaminated material removed during construction may also require monitoring.

#### ***B. Disposal Phase***

1. Prior to filling, a water quality model can be used to determine if restrictions on volume/timing of disposal events are required. Such restrictions could include tidal stage, tidal current, disposal volume, multiple disposal event timing, and proximity in time to expected vessel passage.
2. If project sequencing allows, disposal of the most contaminated material first (deepest in the cell) will allow for the greatest level of sequestering. At a minimum, the more contaminated sediments should not be disposed in the final stages of cell filling.
3. Bathymetric surveys should be performed after each disposal to track remaining capacity and consolidation and to detect uneven accumulation.
4. Documentation of each disposal event should include the date, time and source of material dredged; the time and location of disposal (including high accuracy location coupled with orientation of the disposal vessel); the equipment used to dredge and dispose of the material; the weather and sea conditions; and personnel on duty. It is also helpful to have an estimate of the volume of material disposed even if based on scow loads using drafts and depths and reduced by estimates of water in the scow.
5. Detailed, step-by-step requirements for filling should be included in the DMP.

BHNIP - Some of the key constraints that were placed on disposal included:

- Disposal only during a three-hour period around high water slack tide (1 hour prior to 2 hours after the predicted high tide). This requirement was based on water quality modeling results that showed maximum dilution (into the high-tide water column) and reduced transport (with limited tidal current). Because no significant water column impacts were detected during the monitoring, this requirement was relaxed near the end of the project to allow for disposal around low water slack.
- Disposal during expected fish migration periods required the presence of a fisheries observer, fish-detecting sonar, and a fish-startle system. Although disposal was performed during migration periods, significant fish schools were never detected in the vicinity of disposal.
- No disposal while other tugs/vessels are within 1000 feet of the disposal cell
- Disposal of the most contaminated material in the lower half of the cell

### ***C. Consolidation Phase***

After disposal is completed, adequate time is needed for the material to consolidate prior to capping. Premature capping may result in mixing of cap and underlying material and possibly major shifts of material resulting in a submerged cap. The optimal time depends on the material, the depth of the cell, and the history of disposal events. During consolidation, bathymetric surveys should be performed to track changes. Surface grab samples should be collected periodically from different areas of the cell to observe physical characteristics of material and check consistency across the cell. These samples are easily collected and can be performed in conjunction with the bathymetry. Capping should be delayed at least until consolidation begins to level out and the surface material is not fluid. A more detailed evaluation would require corings and lab evaluations and/or use of a cone penetrometer. At this time there are no clear criteria available to evaluate the readiness to cap. Current research is underway at WES and MIT on this topic.

#### **BHNIP**

- For the type of material disposed in the BHNIP coupled with the cell design, a minimum of 2 months was required for successful capping. The best capping results were obtained after a 5 month consolidation period.
- As a simple means of assessing the relative water content of the surficial sediments in the disposal cell, grab samples were dropped onto the center of a flat board with measured concentric circles. The spread of the material on the board over a fixed time was photographed and recorded as a semi-quantitative method of tracking consolidation. While there is no scientific criteria to correlate these observations with readiness to cap, this technique did demonstrate when the upper material stopped its rapid consolidation and may also have been an indication that deeper underlying material has also reached a more stable phase.

### ***D. Capping Phase***

1. Equipment – A variety of equipment can be used for placement of cap material including split-hulled hopper dredges or scows (only if opening of the hull can be accurately controlled), washing off flat-deck barges, and piping down with a broadcaster. The method selected should be one that has been used successfully at a similar location and/or one the contractor is familiar with.
2. Placement - Cap material should be placed wet. Vessel movement should be perpendicular with the long axis of the vessel opening. Tugs should be used to move the deeper draft, self-propelled vessels to minimize prop wash effects. Overcapping should not be allowed as this may create more mixing with disposed material. Capping should be performed without the use of spuds or anchors within the cell. Once in place, the cap material should not be reworked, such as with a bucket or drag bar.
3. Tracking - During each capping event the volume dumped and the track of the disposal vehicle should be computed to determine where the following load should be placed (if multiple loads are required) to keep the cap thickness as even as possible until the required thickness is achieved. Bathymetric surveys may help in evaluating cap status but the results can be misleading since consolidation increases with the cap weight. It is likely that the surface will be very flat due to the very soft conditions on the top of the dredged material. Any unevenness on the cap surface is a positive result indicating that the underlying material has enough structure to hold a shape under the weight of the cap.
4. Immediately after capping is completed a bathymetric survey should be completed which will serve as the base for future monitoring. This survey will assist in tracking post-cap consolidation and possibly material accumulation over the cap. Alternative methods for determining cap thickness as capping progresses should be explored.

#### **BHNIP**

- Capping of the first BHNIP cell involved placement of dry sand from a stationary split-hulled scow, relying on ambient current to distribute the sand. This method proved ineffective at evenly distributing sand over the cell.
- Subsequent capping events utilized a hopper dredge discharging wet sand. The most even distribution was achieved using a tug in a “T” configuration pushing the dredge sideways with minimal maneuvering by the dredges’ own propulsion.

#### IV. Monitoring

**A. Baseline Monitoring** – Baseline conditions of general water quality (dissolved oxygen, suspended solids, turbidity) as well as specific contaminants of concern (those determined to be in the dredged material to be disposed) need to be assessed prior to the start of any project work. Adequate data may exist from past water quality studies for a given area. It is important that the baseline data include a range of conditions, as the water quality parameters and contaminant concentrations may vary significantly over short time scales, dependent on weather conditions and vessel passage. It is important to determine if water quality criteria and standards are already being exceeded under “normal” (non-project) conditions.

**B. Monitoring Placement of Material During Disposal** – Monitoring the placement of the dredged material within the cell includes tracking the position and orientation of the disposal operation to verify that the material was discharged at the intended location and performance of pre- and post-disposal bathymetry over the cell and the surrounding area to ensure that disposed material was contained within the cell.

BHNIP – The contractor performing the work tracked disposal location and performed the pre- and post-disposal bathymetry. A Corps-certified inspector (and often Corps personnel) was onboard the scow/attending tug for each disposal event. The Corps survey team performed periodic bathymetry checks over the open cells and surrounding area.

#### **C. Water Quality Monitoring During Operations**

1. General Scope – As dredged material is disposed into a CAD cell, some sediment and associated contaminants are released to the water column. The overall goal of the water quality monitoring is to ensure that this release is minimized and that it does not result in unacceptable impacts to the water column.

The balance between an effective monitoring program and program costs is a difficult one. This balance can be better achieved with a program that has frequent field efforts performing real-time measurements of turbidity and collecting samples for analysis of total suspended solids and less-frequent monitoring that involves analysis of contaminants. Given the nature of the disposal and potential release to the water column, the turbidity and total suspended solids measurements can be good, cost-effective indicator of potential water column impacts. The more expensive contaminant analyses should be reserved for project startup of an operation that has a greater potential for contaminant release or as a contingency when the routine monitoring indicates a potential issue.

Some detail can be written into the overall monitoring plan, such as the size of the mixing zone that is granted (detailing as what distance from the disposal operation monitoring should take place). However, given the intrinsic variability of

currents in the coastal marine environment, specific sampling locations should be determined in the field based on real-time measurements of supporting information such as turbidity, drogue tracks, and profiling of currents and suspended solids.

2. Contingencies – Prior to the start of the project, contingencies should be established that set target water quality criteria, detail when more intensive monitoring should be performed, and outline what monitoring results require modification to project operations.

3. Who Should Perform the Monitoring – For a project involving a single dredging contractor, having the contractor responsible for the monitoring simplifies many of the logistical issues associated with integration of the monitoring into the overall construction operation. However, this practice generally results in the monitoring contract awarded to the lowest bidder. Hence, performance standards for the environmental contractor must be clearly stated.

4. Quality Assurance – Accurate monitoring data is critical to making informed decisions regarding project operations. A set of quality assurance objectives and practices should be developed as part of the Water Quality Certification process. This set should include reference to standard field practices, instrument calibration standards, and laboratory methodologies. This quality assurance framework would then be included as background to any environmental contractors bidding on performing the monitoring. The selected contractor would be required to submit a Quality Assurance Project Plan detailing how they would meet the objectives.

BHNIP – Because this was the first use of constructed CAD cells in Massachusetts waters and because of concerns over mobilizing contaminated Boston Harbor sediments, an intensive monitoring program was required that focused on monitoring of disposal events. The program included a significant amount of laboratory analysis. The field monitoring revealed limited transport of material away from the cells following a disposal event, and there were no reported exceedences of target water quality criteria over the entire project.

#### ***D. Verification of Cap Placement***

1. General Scope – The monitoring of cap placement includes verification of cap thickness, cap composition, and aerial coverage over the cell. The monitoring should provide some physical sampling to ground truth the placement of the cap as well as remote monitoring that can provide greater coverage across the cell. The monitoring should be designed to give broad coverage across the cell as well as focus on potential problem areas identified during tracking of cap placement.

It is believed that problems with a given cap, such as mixing with or displacement of the underlying disposed material occur during or immediately after the capping

operation. Hence, monitoring to verify cap placement can take place relatively soon after capping operations are completed. For cells that are depressed below the surrounding area and in areas where existing bottom sediments are frequently mobilized (by vessel traffic or by waver/current events), the monitoring should be scheduled for soon after cap completion to avoid the complicating issue of new deposition over the cap.

2. Contingencies – Prior to the start of the project, triggers should be established that detail when additional cap data should be collected.

3. Quality Assurance – Accurate monitoring data are critical to making informed decisions regarding cap coverage. Similar to the water quality monitoring, a set of quality assurance objectives and practices should be developed as part of the Water Quality Certification process. This set should include target recovery for cores and density of tracklines for geophysical surveys.

BHNIP – Verification of cap placement was accomplished with a combination of coring and sub-bottom profiling. A high level of coring expertise was required to achieve good core recoveries in the coarse sand overlying soft silts from maintenance dredging. Core locations were targeted at the intersections of the sub-bottom profiling tracklines to provide greater correlation between the two methods. Grain size analyses were performed on a subset of core sections. These proved very beneficial, as a limited amount of the disposed sediments (predominantly black silt) mixed with the light-colored capping sand could result in a misleading visual interpretation.

**E. Post-Closure Monitoring** – A long-term monitoring plan should be developed that will verify continued cap coverage for those cells requiring a cap and verify disposed material placement in those cells without a cap. The monitoring should also be designed to track recovery of the benthic community over the cell. This monitoring should be patterned after the Disposal Area Monitoring System (DAMOS) currently performed by the U.S. Army Corps of Engineers at open water disposal sites. It is important to maintain all as-built documentation for comparison to future monitoring results. Responsibility for who will perform the monitoring, who will review the results, and who will perform any corrective measures (if required) must be established as part of the initial project.

**F. Technical Advisory Committee** – Permitting of the overall CAD project draws upon input from regulatory agencies, project proponents, and environmental and business groups. This group should be formalized into a Technical Advisory Committee (TAC) that should be maintained at least through the start up of the overall project. If permitting agencies agree to the TAC concept, the TAC can have the following goals:

- Determine what permit modifications may be required as execution of the project necessitates operational changes or when unexpected issues arise.
- Determine when and if contingencies need to be put in place based on review of monitoring data.



- Disseminate information about the progress of the project to a wider circle.

If the TAC model is followed, a mechanism for making recommendations and communicating those recommendations to the permitting agencies should be established at the outset of the project.

BHNIP – The TAC met approximately every two weeks during project startup and monthly during the heaviest phase of dredging/monitoring. There was regular attendance by representatives from the following:

- Massachusetts Department of Environmental Protection
- U.S. Environmental Protection Agency
- Massachusetts Coastal Zone Management
- U.S. Army Corps of Engineers
- Massachusetts Port Authority
- Dredging Contractor (Weeks Marine – Phase 1, Great Lakes Dredge & Dock – Phase 2)
- Seaport Advisory Council
- MIT Sea Grant
- The Boston Harbor Association
- Save the Harbor/Save the Bay
- Clean Water Action
- Independent Observer

Other agencies/groups that attended meetings less frequently, but remained in the communication network and provided input throughout the project included:

- Massachusetts Division of Marine Fisheries
- National Marine Fisheries Service
- Massachusetts Lobsterman Association

The TAC made numerous recommendations on changes to project operations and modifications to the Water Quality Certification.

**G. Independent Observer** – If the overall project is large enough to support an independent observer, incorporation of the roll can provide the following:

- Interpretation of issues arising on the project and monitoring results.
- Communicate project progress and issues to TAC.
- Facilitate TAC meetings.

BHNIP – The independent observer position was defined and administered by Massachusetts Coastal Zone Management. Funding for the position was provided by one of the project proponents (Massport). The observer was present on site frequently at the outset of the project and during startup of new phases of construction. The observer facilitated TAC meetings for the duration of the project. The on-site presence diminished as the project progressed, but the communication role continued throughout the project.



**APPENDIX D**

**The Model Water Quality Certificate**

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## Introduction

This document provides a series of consideration points in developing a Water Quality Certification (WQC) for projects involving dredging and confined aquatic disposal of dredged material that is unsuitable for unconfined open water disposal. For the purposes of this document, confined aquatic disposal (commonly referred to as CAD) involves disposing the dredged material entirely within the aquatic environment, and sequestering it by placement within constructed cells or natural depressions on the bottom of harbors, bays, or other coastal environments.

The consideration points presented here are based on experience from the Boston Harbor Navigation Improvement Project (BHNIP) and review of other related projects. The organization of an actual WQC has been followed. A fictitious project (referred to as "Harbor X") is described in order to provide specific examples. Relevant aspects of the BHNIP are also included.

Examples from the fictitious project **Harbor X** and the **BHNIP** are included in the text boxes throughout the document.

The discussion and examples are focused on projects that involve complexity in the operations, are performed over an extended time frame, and/or are controversial in nature. The document is presented in outline format, and subject headings that are not relevant to a particular project could be included and noted as not applicable. This will maintain consistency in WQC for dredging/disposal projects, and allow for easier review and use.

Reference is made to a Dredging Management Plan (DMP) within the discussion (see ENSR 2001b for DMP example). It is assumed that such a plan is submitted along with the application for WQC.

## List of Abbreviations

BMP – Best Management Practices  
CAD – Confined Aquatic Disposal  
cy – Cubic Yards  
DMP – Dredging Management Plan  
EIR – Environmental Impact Report  
GIS – Geographic Information System  
MLW – Mean Low Water  
WQC – Water Quality Certification

## Water Quality Certification

### Dredging Projects Including CAD Cell Disposal

#### I. Project Description

**A. Overview** – A short (1-2 paragraph) description of the project should be provided. This section could be extracted directly from the DMP for the project.

**Example Harbor X** - Harbor X lies along a southern facing New England shoreline as shown in Figure 1. The overall objective of the Harbor X Improvement Project is maintenance dredging of the 25-foot approach channel into the harbor and four berth areas as well as dredging of a new anchorage area. Some of the sediments to be removed have elevated levels of contaminants, and Confined Aquatic Disposal (CAD) has been selected as the disposal method. The dredging project includes removal of an estimated 225,100 cy of sediments (not including construction of the cell), of which 60,600 cy are suitable for open water disposal and 164,500 cy are unsuitable for open water disposal.

**B. Proposed Project** – This section should detail the proposed project and include the components listed below. This section could be extracted directly from the DMP for the project, and should be presented in tabular or list format. A figure is critical.

- Location, proposed depth, material type, and amount to be removed.
- Location and type of disposal of dredged material.
- Expected time frame of the project.

**C. Existing Conditions and Environmental Concerns** - A detailed description of the existing conditions for the project should be available in the EIR. Data in the EIR should be presented in GIS format, with an electronic deliverable to the DEP. This will allow for clear presentation within the Water Quality Certification related to potential environmental concerns

1. Physical Conditions – Basic information on tides, currents, prevailing winds, water depths, and bottom types should be presented.
2. Benthic Habitat – A summary of the benthic habitats in the vicinity of the project should be presented. This is best presented by figure in GIS format, with a listing of specific areas of concern and the reasons why.

**Example Harbor X** – A summary of the benthic habitats in the vicinity of Harbor Improvement Project can be found in Figure 1. The following are specific concerns related to this project:

- Direct disturbance of oyster and clam bed habitats during dredging of Berth 4 and the anchorage.
- Indirect impacts to oyster and clam beds and other surrounding benthic habitat due to deposition of sediment suspended during dredging and support activities.

3. Fish – A summary of the important pelagic and demersal fish species for the area should be presented. This should include the relevant location(s), seasonality, and specific environmental concerns.
4. Commercial Fisheries – A summary of all relevant commercial fisheries should be presented. This should include stocks that are fished in the affected area, stocks that are fished elsewhere but may be impacted by the project, and project activities that may affect fishermen transiting to other areas. Specific dates of importance for each fishery should also be presented.

**BHNIP** – Several issues regarding lobster arose during performance of the BHNIP. Scheduling of dredging in specific areas became an issue as lobster catches began to increase in the spring 1999. Although the lobster resource had been addressed in the EIR, seasonality was not specifically noted in the WQC. Even if there will not be specific conditions placed on the project regarding a given fishery, this should be noted in the WQC along with the rationale or EIR reference.

Another issue arose on the BHNIP outside of the specific dredging area. Improvement material that was dredged within the harbor was transported offshore for disposal at the Massachusetts Bay Disposal Site. Transiting the inner harbor, dump scows were maneuvered with a tug alongside or on a short tow. The transition to a longer tow for the trip offshore was made in the outer harbor, away from the project, but in an area heavily fished for lobster during some seasons. In lengthening or shortening the towline, slack would sometime develop, causing the heavy wire towline to drag the bottom. Although this generally occurred for a short distance, lines of traps on the bottom were occasionally dragged or damaged.

5. Sediment Quality – Sediment quality data and physical characteristics should be presented in tabular rather than narrative format. Presented data should include mean and maximum sediment concentrations for specific areas affected by the project. A reference should be included for the presented data.
6. Water Quality – In addition to the water quality designation for the affected waters, reference should be included to any ongoing or recent water quality monitoring studies. Specific concerns should be presented such as increased turbidity/suspended solids blocking light penetration over sensitive areas, transport of contaminants bound to particulate, release of dissolved contaminants, or impacts to dissolved oxygen.

## II. Regulatory History

**A. *Permitting Background*** – Preparation of a draft and final EIR for the project should be noted as well as applicable State regulations such as affected wetlands or designated port area.

**B. *Comments Received***

**C. *Section 61 Findings***

### **III. Conditions**

#### ***A. General Conditions***

1. Standard Conditions – Conditions related to antidegradation, notification period, length of performance, and contact information that are generally similar between projects.
2. Monitoring Criteria – Listing of the specific criteria that the project will be evaluated against and the location of compliance. In addition to any specific contaminants of concern, performance standards should be set for both total suspended solids (lab measured) and turbidity (field measured).
3. QA/QC and Lab Requirements – Listing of specific lab methodologies, detection limits, and QA/QC requirements.
4. Reporting – Listing of reporting format, deliverable type, and required schedule.

#### ***B. Dredging***

1. Equipment – The requirement for a sealed environmental bucket for maintenance (contaminated) material removal should be evaluated for each project. When used for production dredging, recent investigations by the Waterways Experiment Station have shown that the difference in performance (in terms of material loss to the water column) between conventional open and closed environmental buckets may not be all that great (Welp et al., 2001). In addition, the closed buckets tested tended to increase the water content of the dredged material to a greater degree than the open bucket. This can be problematic depending on the type of disposal that is planned.

If an environmental bucket is required for use on a project, its use should be governed by the performance standards set for the project, rather than performance specifications reported by a particular brand bucket. The conditions under which a particular bucket's performance was measured may have included a very controlled remediation application atypical for navigation dredging projects. Other closed environmental buckets fabricated by contractors from standard open buckets have been found to perform adequately under typical conditions but have no performance measurements. Initial monitoring should be used to determine the suitability of a bucket.

2. Operational Requirements – The manner in which the dredge is operated can have a greater impact on release of material to the water column than the type of bucket used. A push to increase production and decrease the cycle time (time to remove one bucket, empty into a scow, and return to the water) can significantly increase suspension of sediments as the bucket impacts the bottom, as it leaves the bottom, and as it exits the water. Rather than specifying the operation itself,



periodic monitoring should be performed to ensure that turbidity/total suspended solids performance goals are being met at the compliance point.

3. Monitoring Specifics – Because of the variable nature of the dredging process and the associated variable release of suspended material, water column effects from dredging can be very transient. Monitoring should incorporate real-time measurements to identify the presence of a suspended solids plume with conditional sampling. Specific components include the following:

- Equipment – Measurements of turbidity, light transmittance, and particle backscatter can all be used to provide real-time assessment of the presence of a plume. The key is that the equipment be able to provide a snapshot view of suspended material in real time over a spatial/depth scale relevant to the particular project and resources of interest.
- Location – Although the monitoring will focus on the compliance point at a particular distance down current of the operation, it should also include measurements as near to the dredging operation as safe and practical as well as detailed background measurements. The goal is to be able to infer suspended solids source strength at the dredge and attenuation down current without the influence of non-project sources.
- Timing - Monitoring of dredging should be performed periodically throughout the project, focusing on changes of equipment, operators, or conditions of dredging (such as a move to a higher current or debris area). If the dredging is located adjacent to a sensitive area, continuous monitoring can be performed with a moored sensor. Data can be physically downloaded on a regular basis or collected via telemetry.
- Supplemental Sampling – Collection of water samples for laboratory analysis of total suspended solids should be performed at a limited number of locations to supplement the real-time measurements. Analysis for other parameters should only be performed if the real-time measurements identify a significant plume or if there is a particular concern about dissolved constituents being released during the dredging (potentially causing a water quality issue without a related suspended solids plume).

**BHNIP** – Monitoring of dredging-related impacts to water quality was required at the beginning of Phase 1 of the project, and limited monitoring was required with the start up of a new contractor at the beginning of Phase 2. However, no additional monitoring of dredging operations was required during the remainder of Phase 2 (nearly two years in length), a period that included multiple changes in dredge plant, buckets, location, operating conditions, and operators. Limited real-time monitoring at periodic intervals or for specified location/operation changes could have been tied to other required monitoring events to provide a cost-effective check on the dredging operation.

In general, the WQC should include a provision for reducing the scope of the overall monitoring effort if the scope of the initial monitoring reveals impacts far reduced from those identified through predictive modeling that may have been part of the Environmental Impact Report.

**Example Harbor X** – Monitoring during dredging will include

- One monitoring event during the first week of dredging, with dredging being performed at what is considered a typical pace for the project. Monitoring will be performed during periods of peak ebb and flood tidal currents. Monitoring will include point measurements of turbidity as well as water column current structure and particle backscatter. Monitoring coverage should be sufficient to map suspended solids plume emanating from the dredge and to track the plume down current until it is no longer detectable. Samples will be collected at a background location, immediately down current of the operation, and down current at the compliance location. Samples will be collected in the axis of any identified plume and at the depth in the water column with maximum turbidity signal. Samples will be analyzed for total suspended solids. Analysis of the project list of contaminants of concern will only be required if the turbidity performance standard has been exceeded at the compliance location.
- Additional monitoring events identical in scope to that described above will be performed when dredging is initiated at berth areas 1-2, 3, 4; at the anchorage area; and with each major change in dredge bucket size or type.

4. Exceedences of Water Quality Criteria – An exceedence of a water quality criterion typically triggers a resampling effort to verify the results. However, as the analytical results are received 1-2 days following the original effort and scheduling the resampling takes another 1-2 days, the activity generating the exceedence may have already been completed. Setting performance standards for the real-time measurements such as turbidity allows for real-time feedback on the operation. Sampling and follow up laboratory analysis can be conditional, triggered only by an exceedence of performance standards for the real-time measurements.

### C. Disposal

1. Equipment – Disposal scows require initial and periodic inspection to assure workability for a given project. In general, it is impractical for a dump scow to be 100% watertight. Monitoring for turbidity and total suspended solids in the vicinity of the scow may be required if the transit to the disposal cell or area is lengthy and/or passes nearby to more sensitive areas.

The navigational system used to position the scow over a cell or disposal area must have an accuracy adequate for the scale of the scow relative to the cell. The positioning system should include a real-time display that depicts the dump scow relative to the cell boundary.

2. Operational Requirements – Some of the operational requirements listed below are discussed in greater detail in the Best Management Practices for confined aquatic disposal (ENSR, 2001b).

- Timing/Volume Restrictions – Restrictions could include tidal stage, tidal current, disposal volume, multiple disposal event timing, and proximity in time to expected vessel passage. Tugs or support vessels should be required to limit maneuvering over the cell following the disposal event.

- Sequencing – If project operations allow, disposal of the most contaminated material should occur early in the project to allow the greatest level of sequestering (deepest in the cell). At a minimum, the more contaminated material should not be disposed in the final stages of cell filling.
- Tracking Cell Capacity - Bathymetric surveys should be performed after each disposal to track remaining capacity and consolidation and to detect uneven accumulation.
- Documentation - Documentation of each disposal event should include the date, time and source of material dredged; the time and location of disposal (including high accuracy location coupled with orientation of the disposal vessel); the equipment used to dredge and dispose of the material; the weather and sea conditions; and personnel on duty. It is also helpful to have an estimate of the volume of material disposed even if based on scow loads using drafts and depths and reduced by estimates of water in the scow.

**BHNIP** - Some of the key constraints that were placed on disposal included:

- Disposal only during a three-hour period around high water slack tide (1 hour prior to 2 hours after the predicted high tide). This requirement was based on water quality modeling results that showed maximum dilution (into the high-tide water column) and reduced transport during the monitoring. The WQC was amended near the end of the project to allow for disposal around low water slack following monitoring of a trial.
- Disposal during expected fish migration periods required the presence of a fisheries observer, fish-detecting sonar, and a fish-startle system. Although disposal was performed during migration periods, significant fish schools were never detected in the vicinity of disposal.
- No disposal while other tugs/vessels are within 1000 feet of the disposal cell. The high tide disposal requirement often made this an issue as vessels often schedule arrival to/departure from the harbor around the high tide. The dredging contractor sometimes hurried to get a disposal event in prior to the departure of a nearby vessel. This resulted in vessels passing nearby or over a cell a short time after a disposal event occurred.
- Disposal of the most contaminated material in the lower half of the cell.

3. Monitoring Specifics – Monitoring requirements following disposal are very similar to those associated with dredging described above. Because the disposal is a short-term event with potential generation of a pulse-type plume, real-time measurements are key to identifying any water column impacts. Specific components of the monitoring could include the following:

- Equipment – Measurements of turbidity, light transmittance, and particle backscatter can all be used to provide real-time assessment of the presence of a plume. The key is that the equipment be able to provide a snapshot view of suspended material in real time over a spatial/depth scale relevant to the disposal cell and down current areas of interest.
- Location – Although the monitoring will focus on the compliance point at a particular distance down current of the operation, it should also include measurements directly over the disposal cell prior to and following the disposal event to aid in identifying if the event actually produced a plume.

- **Timing** – For an individual event, monitoring should begin immediately following disposal into the cell. If the real-time monitoring identifies a plume moving away from the cell, monitoring/sampling at the compliance point should be timed to intercept the plume. Overall, the disposal monitoring should be performed periodically throughout the project, with emphasis on initial disposal, disposal of the material with highest contamination, and disposal as the cell nears capacity. If the cell is located adjacent to a sensitive area, continuous monitoring can also be performed with a moored sensor. Data can be physically downloaded on a regular basis or collected via telemetry.
- **Supplemental Sampling** – Collection of water samples for laboratory analysis of total suspended solids should be performed at a limited number of locations to supplement the real-time measurements. Analysis for other parameters should only be performed if the real-time measurements identify a significant plume or if there is a particular concern about dissolved constituents being released during the dredging (potentially causing a water quality issue without a related suspended solids plume).

**BHNIP** – Although a very intensive monitoring program was specified for the BHNIP, much of the monitoring occurred early in the project and/or was grouped into a series of sequential events. There were significant time periods (2-5 months) with no monitoring required, and very little monitoring was performed as cells neared capacity. Sampling and analysis were hardwired into the monitoring regardless of the results of real-time monitoring, significantly increasing the cost of each event.

4. **Exceedences of Water Quality Criteria** – Similar to the requirements for dredging, setting performance standards for disposal operations for real-time measurements such as turbidity allows for real-time feedback on the operation. Sampling and follow up laboratory analysis can be conditional, triggered only by an exceedence of performance standards for the real-time measurements. The frequency of monitoring can be increased with the savings gained from the reduced analytical costs.

**D. Capping** - As the WQC will contain the specific performance standards for the cap, it is important to include a mechanism for assessing the “success” of a capping effort. A metric could be developed to score the performance of a given cap, with points specified for coverage, thickness, mixing of capping/capped material, and material on top of the cap. The “goal” for the number of points that would establish the effort as successful, i.e., not needing additional capping, could be based on factors such as the level of contamination of the material within the cell, similarity of the material within the cell to the surrounding harbor bottom, movement of water over the cell, and the proximity of the cell to specific habitats of concern.

Prior to the start of capping, a plan should be submitted to the DEP for approval. The plan should address the following components:

- Determination of the readiness of the cell contents for capping.
- Methodology for placement of the cap.
- Monitoring performed during cap placement to assess coverage.
- Post-capping monitoring to verify coverage and thickness.

A detailed description of cap placement and monitoring can be found in Best Management Practices – Confined Aquatic Disposal (ENSR 2001a).

**E. Post-Project** – Post-project monitoring should be patterned after the U.S. Army Corps' Disposal Area Monitoring System (DAMOS) and should include the following considerations:

- Seasonality - Monitoring performed to assess biological recovery over a cell should be scheduled to occur in mid summer to capture peak biological activity.
- Sediment Profile Imaging – Sediment profile imaging is a good tool to assess biological activity as well as sediment type of the upper surface of the cell.
- Deposition – Assessment of deposition occurring over the cell relative to adjacent bottom areas.
- Bathymetry – Used to assess general cell condition and consolidation when combined with deposition.

Sub-bottom profiling could be performed on a less than annual basis to assess overall cell/contents structure or if the more frequent monitoring reveals questions or issues. Coring is not recommended except to address specific concerns raised by the monitoring.

**F. Protection of Fisheries** – In addition to the standard information on environmental windows and fisheries observers, the following requirements would be beneficial for some projects:

- Notification prior to dredge relocation – For projects that cover a large area or multiple area and are performed over an extended period of time, a notification system should be set up through the Division of Marine Fisheries to ensure that fisherman have sufficient time to relocate fishing gear prior to movement of a dredge into a particular area.
- Impacting bottom gear – Towing and maneuvering scows should be performed in such a way that the tow line does not impact the bottom.

**G. Communication** – With a larger project, issues often arise that require consultation with regulators, particularly at the outset. A summary table of contacts would be very helpful.

Contact Person/Area of Responsibility	Contact Information
Report Submittals	Name/Address/Fax/Email
DEP primary contact	Phone/email
DEP backup contact #1	Phone/email
DEP backup contact #2	Phone/email
Fisheries primary contact	Phone/email
Fisheries backup contact	Phone/email
Marine mammal primary contact	Phone/email
Marine mammal backup contact	Phone/email
Other relevant contacts	Phone/email
24-hour emergency contact	Phone

**H. Technical Advisory Committee** – If a Technical Advisory Committee is expected to actively participate during the execution of the project, its role should be clearly defined in the WQC. In particular, the preferred mechanism for communicating recommendations to the DEP should be defined.

**I. Independent Observer** – If the overall project is large enough to support an independent observer, the WQC can detail specific responsibilities for the role, potentially including the following:

- Direct observation of specific components of the project.
- Interpretation of issues arising on the project and monitoring results.
- Tracking of project milestones and required monitoring.
- Communication of project progress and issues to the Technical Advisory Committee.
- Facilitation of Technical Advisory Committee meetings.

**BHNIP** – The independent observer position was defined and administered by Massachusetts Coastal Zone Management. Funding for the position was provided by one of the project proponents (Massport). From the outset, it was clear that the Corps' inspectors provided an adequate level of oversight for the logistical components of the project such as dredging location, disposal amounts, and disposal location. The observer was present on site frequently at the beginning of the project and during startup of new phases of construction with the goal of documenting the activity (video, photos, and notes) and distributing the information to the Technical Advisory Committee. The observer tracked project activities versus those restricted or requiring monitoring in the WQC and provided summaries and interpretation of results. The observer also facilitated Technical Advisory Committee meetings for the duration of the project. The on-site presence diminished as the project progressed, but the communication role with the contractor, project proponents, and Technical Advisory Committee continued throughout the project.

A project-specific web site is now relatively easy to establish and maintain. This could be an effective means to disseminate information and reduce the number of meetings for larger projects. The web site could be set up with password access for members of the Technical Advisory Committee and could contain a complete record of project activities, observations (including photos and video clips), monitoring data, and comment/discussion areas.

**IV. Summaries** – Tables summarizing some of the requirements of the WQC would be beneficial for a more complex project or for one carried out over an extended time frame. The following are provided as examples for the “Harbor X” project.

***A. Summary of Operational Restrictions***

<b>Time Period</b>	<b>Operational Restriction</b>
Entire Project	Disposal into cells only during two-hour period (+1/-1 hour) around the predicted time of high or low tide.
Entire Project	Minimal maneuvering over cell following disposal.
Entire Project	No disposal into cell when vessel (ship) passage over the cell is anticipated to occur within ½ hour following disposal.
15 Feb – 15 Jun	No blasting.
15 Feb – 15 Jun	Fisheries observer and sonar system required to ensure cell area if clear of migratory schools of fish prior to disposal into cell.
1 Apr – 30 Nov	Distribution of weekly schedule of dredging locations and minimum 4 day advance notification of relocation of dredge to new area within harbor.

### ***B. Summary of Monitoring Requirements***

<b>Monitoring Type</b>	<b>Timing Requirements</b>	<b>Sampling Requirements</b>
Dredging of maintenance material	1 ebb/flood period during first week of dredging	Turbidity (real-time), TSS, metals
	1 ebb/flood period during first 2 days of dredging of berth 1-2	Turbidity (real-time), TSS
	1 ebb/flood period during first 2 days of dredging of berth 3	Turbidity (real-time), TSS, metals, PAH
	1 ebb/flood period during first 2 days of dredging of berth 4	Turbidity (real-time), TSS
	1 ebb/flood period during first 2 days of dredging of anchorage area	Turbidity (real-time), TSS
	Unspecified number – 1 ebb/flood period for each change to a new bucket size/type	Turbidity (real-time), TSS
Dredging of improvement material	1 ebb/flood period during first week of dredging	Turbidity (real-time), TSS
	1 ebb/flood period during first two days of dredging of anchorage area	Turbidity (real-time), TSS
	Unspecified number – 1 ebb/flood period for each change to a new bucket size/type	Turbidity (real-time), TSS
Disposal	1 event during first week of disposal	Turbidity (real-time), TSS, metals
	1 event during first time two or more scows are disposed during a single tidal window (monitoring following both disposal)	Turbidity (real-time), TSS
	1 event during disposal of berth 3 material	Turbidity (real-time), TSS, metals, PAH
	1 event when the cell is approximately 90% filled	Turbidity (real-time), TSS
	1 event after the cell is approximately 95% filled	Turbidity (real-time), TSS
	Minimum 1 event every month	Turbidity (real-time), TSS

Note: Sampling requirements will include metals (and PAH for berth 3 related material) whenever real-time monitoring reveals exceedence of turbidity performance standard.

### ***References***

- ENSR, 2001a. Best Management Practices – Confined Aquatic Disposal. Submitted to the Maguire Group/MA Coastal Zone Management. March 2001.
- ENSR, 2001b. Best Management Practices – Example Dredging Management Plan. Submitted to the Maguire Group/MA Coastal Zone Management. August 2001.
- Welp, T., D. Hayes, M. Tubman, S. McDowell, T. Fredette, J. Clausner, C. Albro. 2001. Dredge Bucket Comparison Demonstration at Boston Harbor. U.S. Army Corps of Engineers ERDC/CHL, CHETN-VI-35, March 2001.